SCIENCE

VOL. 99 FRIDAY, JUNE 30, 1944 No. 2583

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SCIENCE: A Weekly Journal devoted to the Advancement of Science. Editorial communications should be sent to the editors of SCIENCE, Lancaster, Pa. Published every Friday by

THE SCIENCE PRESS

Lancaster, Pennsylvania

Annual Subscription, $6.00 Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the Association may be secured from the office of the permanent secretary in the Smithsonian Institution Building, Washington 25, D. C.

THE LONG AND SHORT OF NUTRITION[1]

By Professor HENRY A. MATTILL

STATE UNIVERSITY OF IOWA

MODERN nutrition was getting under way about the time of World War I; it is about as old as the science of aviation. The origins of both can be dated somewhat earlier, but in the intervening years of gradual development the few voices that were raised in high prophecy were drowned out by the derision of scoffers. Many of the classical nutritionists who had dealt with protein and calories snorted at the simple techniques of the new school as representing a bankruptcy of brains. "Anybody can feed animals, anybody can do vitamin work." It may be admitted that anybody could have done some of it, that some of it should perhaps not have been done by anybody, but to-day it stands justified. Not only has the "importance of little things" in the diet been revealed, but remarkable progress has been made in the understanding of how these little things work. With the growth of the concept of vitamins there have been amazing advances in the study of enzymes, some of which contain vitamin components in the molecule or require them as co-enzymes. Through the jungle of cellular oxidation trails are gradually being blazed; the uninitiated traveler can not yet readily find his way, but the paths are being cleared and markers and guide-posts are being placed. The new vantage points thus provided have suggested new approaches to the study of the metabolism of all the foodstuffs, in particular, of minerals and of protein.

Discoveries in physics, in theoretical and organic chemistry and the new techniques growing out of them have furnished new tools for the solution of old problems. They have also created new problems, and have raised more questions than they have answered. Levene[2] once said, "so long as life continues the human mind will create mysteries." But we can also

[1] From an address on the Annual Sigma Xi Day at the University of Rochester on February 22, 1944.

[2] P. A. Levene, SCIENCE, 74: 23, 1931.

subscribe to the faith which Sir Frederick Hopkins[3] expressed in his Harvard Tercentenary address, that "biochemical and physiological activities will in the end reach to a description of living systems which, in so far as they are chemical systems, will be complete."

If there is a "long" and a "short" to nutrition, the description of living systems in completeness is the "short" of it; the goals are almost in sight. The "long" of it will be the application of this knowledge, to the end that the human family shall be more adequately nourished. The reason why this is the "long" of it is that human beings are not merely chemical systems; superimposed are certain incommensurables, imponderables. Ignorance, prejudice and selfishness are among the causes of man's lack of an inward grace, as the prayerbooks say, and these three human attributes plus poverty which results from them are the principal barriers along the road to improved human nutrition.

That the nutrition of the common man, even in prosperous and enlightened North America, is in need of improvement requires no argument. The impact of the war worsened some of the conditions which make for malnutrition and shocked people out of a complacent unawareness. The schedule of recommended daily allowances set up by the National Research Council's Board of Food and Nutrition provided the first comprehensive set of tentative criteria by which dietaries can be assessed. We hear it said that malnutrition can not possibly be as wide-spread as some surveys have implied. A recent account[4] is certainly shocking enough, a study of 24 young married women in a housing project in the Southwest. Calorie intake was 1,145 per day, protein, calcium and phosphorus were also about half the recommended allowances, thiamin, niacin and riboflavin a little above a third. Family income, $13.50 weekly. This may be among the worst, but it can be duplicated elsewhere in the South and perhaps in the North. The exact proportion of undernourished people, whether it is one third, or more, of our population, is not the important item. The real question is why need any be undernourished in a country where surplus food has sometimes been destroyed.

In modern times the western hemisphere has not seen the spectre of famine, but when one includes Asia in his view one may properly ask the question: Can the world produce enough food to feed adequately every one living on it? This question has been answered both ways. Certainly the world as a whole has never had enough food nor could it have enough by to-morrow or by next year, but given ten years to reorganize agriculture and readjust distribution and consumption, perhaps it might. Britain's home production of food has increased from 40 per cent. to 65 per cent. of the requirements during the past three or four years. Our Bureau of Agricultural Economics in its analysis of crops, their cost per acre and per day of labor, used 29.5 bushels of corn per acre as the national average yield. In the upper Mississippi Valley, which is admittedly the bread-basket of the country, the yields of hybrid corn last season averaged over 100 bushels per acre, three times as much. And the Mississippi Valley still has meadows and woodland that are not used for crops.

They tell us[5] that in prewar days 100 acres of crop land in the United States of America fed 32 persons, in Denmark 58 persons, in Sweden 69, and in France 80; these figures are corrected for imports. No one who has ever lived in the country of the Danes or the Swedes will scoff at their food. The agriculture that provided it maintained the land in a high state of productivity by fertilizing, the crops were better cultivated, they were of a kind which require more labor, and thus labor as well as land went into food. More foods were grown for direct human consumption rather than first being converted into meat, dairy products and eggs; and finally the foods produced were utilized more fully. Under a national food policy backed by a planned agriculture, we could feed twice, three times, as many persons per acre of crop land as we are now doing. Even a famine-ridden country like India could approach adequate self-support in food if some of the labor of its millions were efficiently used to grow more food under national planning, on soil made available by irrigation or by the drainage of malarial swamps.

In the north porch of Bath Abbey there is a tablet commemorating Malthus, and as the verger points it out he bemoans the fact that the people of England spurned his teaching and instead followed the example of good Queen Victoria. Was Malthus right when he proclaimed that pestilence, war and famine and the vice and misery that attend them are the only checks upon an increase in population beyond the limits of the earth to support it? Pestilences are slowly being abolished or at least confined; our fighting men may unhappily bring us some of them from India's coral strands, but they will soon be brought under control. This war is to be the last war; it must not be allowed to happen again. And if we also abolish famine the last check on over-population is gone.

There is another horn to this dilemma. The idea of a pint of milk for every Hottentot has occasioned a good deal of raillery, some of it good-natured, some of it biting. Isn't it just possible that if we do not

[3] Sir F. Gowland Hopkins, SCIENCE, 84: 255, 1936.

[4] Jet C. Winters and Ruth E. Leslie, *Jour. Nutrition*, 26: 443, 1943.

[5] John D. Black, "Food Enough," Jaques Cattell Press, 1943, p. 122.

give them milk we will have to give them eggs (otherwise known as bombs)? The world has become so small that it can not long remain at peace if half the people are well fed, the rest ill-fed.

But granted that improved methods of production can greatly increase our own available food supply, with something to spare for the Hottentots, and granted that our standard of living can be maintained whatever our relations and commitments to the rest of the world, how can the rank and file of our citizens be assured of better nutrition? The answer is by education, a dual education in nutrition and in democracy.

In the opinion of many, the great efforts of the human mind manifest themselves much more frequently in times of war than in times of peace. As a nation we are becoming nutrition-conscious; the trend appeared before the war, but the movement for better nutrition has been accelerated by the presence of our fighting men in far-flung arctic and tropical regions, and all that this entails. Because of the mechanized character of this conflict, the nutritional status of industrial workers has attracted an attention that its shortcomings have long demanded. And finally, "food will win the war" in a sense quite beyond that in which the phrase was used three decades ago. Famine is even now stalking through Europe with a heavier tread than history records, and stable governments can not be established by starving nations.

People are always interested in their own health. A liberal thinker in the Protestant ministry once remarked that if he wanted to start a new religious cult or sect he would not fail to include a health clause in his creed; with this it would go over big. The old patent medicine business that still parades under other trappings is proof enough that people want to be well. What they need is enlightenment as to what they can do about it. Nutrition classes under various auspices have been supported with enthusiasm. The press carries some good material and even those who din into our ears the virtues of their vitamin tablets have added their bit. They have received two bits in return, for the American people are buying vitamin pills to the tune of more than 150 million dollars a year. Those who have participated in the development of the vitamin field may well stand aghast at such shameless prostitution of scientific knowledge, an abuse that is fully as reprehensible as the patent medicine game, except that people are getting a little something for their too much money. The real problem is to create an intelligent interest in good nutrition and in how to secure it. Good nutrition can not be achieved by adding a vitamin tablet to an inadequate diet poorly prepared. Man lives not by vitamins alone nor by 15 basic elements, count them. The easy way is not always the sure way.

Industry has lent a hand by improving the kind and quality of food served in factory restaurants and canteens and by providing something better than cokes and candy bars for a mid-morning snack. School lunches, if they are nutritious and well prepared, are heard about at home. Our food processing industries are also helping to spread the gospel of better nutrition; individually and in groups like the Nutrition Foundation, they are sponsoring worthy investigations in food and nutrition.

By and large, the medical profession is not yet making its proper contribution to the enterprise of nutritional education. Nutrition has too long been a stepchild in the medical family; the University of Rochester is a notable exception, as is well known. It is high time that medical students should be made aware of the impact of nutrition upon every aspect of medical practice. A pediatrician lately told me of a letter that came with a child being referred to him, in which the doctor said he did not think that the child's recurrent temperature was caused by the specific dynamic action of food.

Physicians are usually respected leaders in their communities; they can be influential citizens. The medical student should appreciate the fact that if he knows something about nutrition he will be listened to and will be consulted by his colleagues that know less than he does.

But one may say, no matter how well prepared the housewife is to feed her husband and children intelligently, she can not do it if the weekly pay envelope contains only 15 or 20 dollars. This question brings us to the consideration of a national nutrition policy which must embrace the entire economic problem of food production and distribution. Whether our democratic ship of state will embark on these vast and troubled waters remains to be seen, but that it should do so and can do so with some hope of reaching port is made plain by the little book to which reference has already been made.[5]

If we as a nation need education in nutrition and democracy the rationing program is a beginning in both. As compared with the recommendations of the National Research Council, the average estimated consumption per capita per day during the years 1936–1943 was entirely adequate, with the exception of riboflavin and the possible exception of niacin and calcium.[6] On the surface, this looks good, but the catch is that some people got more than their share and others got much less than their share. Rationing helps to relieve the pressure on price ceilings, but its principal function is to secure the distribution of food "more nearly in relation to need and thereby to obtain the greatest social return from the resources

[6] J. M. Cassels and Frances L. Hall, *Ann. Am. Acad. Polit. and Social Sci.*, 225: 106, 1943.

employed in its production."[6] Many Americans can tighten their belts without lessening their health and efficiency.

Even under rationing the lowest income group may still be restricted by limited purchasing power to quantities below the ration level. To allow them to buy as much as their ration cards allow, either their earnings must be supplemented or, as has been done in Great Britain, public restaurants and factory canteens must be established, provision made for school lunches and cheap milk. Food stamp plans might also do it.

The level of consumption in Great Britain since 1939 has been lower than ours, but thanks to excellent wartime food planning and rationing, the general nutritional status of the British people is now probably better than that of a large proportion of the lower-income families in this country. The effects of the war have been unbelievably tragic for the children of Europe, but in the opinion of Geoffrey Bourne,[7] with due allowance for all the disadvantages a child suffers from being brought up under war conditions, to the average British child it has been a benefit to live during the war. "Economic necessity is no longer a bar to obtaining milk, fruit, cod liver oil and other things that are needed for good health and growth. . . . After the war fullest use must be made of our new knowledge and experience on the subject of nutrition for maintaining and developing this improvement." In the words of Sir John Boyd Orr,[7] "priority in post-war planning should be given to the purchase and distribution by the state of basic foods in such quantities and at such prices as will put a health standard of nutrition within the reach of all."

It is doubtful that any measure of success in equable distribution of food can be attained without price control. Those who in 1918 had more than a physiological interest in food know what happened to food prices. The record of price control in the present war is open to all to read, and none are so blind as those who will not see. Too many favor price ceilings for every one but themselves.

Rationing and price control can not be completely effective unless production also is regulated and available supplies are brought into line with expected requirements. Rationing will probably not permanently be an acceptable feature of our national life, but we shall certainly be well advised if we insist on an intelligent system of control over distribution, prices and production for as long as may be necessary to avoid inflation and subsequent depression.

An enlightened democracy should be able so to order its affairs that production and distribution of food will insure every one enough to eat, and a reasonable profit to those concerned, without exploitation. The problem is complicated, but the greatest difficulties lie in man's inertia and in his short-sighted self-seeking. Desirable shifts in agricultural production, in methods of processing and in food habits, these will take time, but the time required to make the actual physical changes is less than that involved in the mental adjustments by which they must be conditioned.

Too many people who presume to speak authoritatively about these complex matters, especially in legislative halls, know too little about them. They should be told what the Irishman told his brother: "Drop that wheelbarrow! What do you know about machinery?" The necessary machinery is not as simple as a wheelbarrow. Also, too many people place private or political advantage before the public interest. There have been pressure groups ever since the caveman became a clansman. Recently in one of the Service Club publications there was a debate on butter *vs.* oleomargarine in which the butter-man said[8] that the reason for the maintenance of high license fees and a ten cent per pound tax on oleomargarine was to protect the consumer against the possibility of fraud. His powerful lobby has recently secured congressional action which continues this surcharge on a good and cheap food fat for those who can not afford to buy butter. The common man has no lobby.

Increased production of food is not enough. Twenty centuries ago a man who deeply desired to make a better world thought that more food might help; he even considered making stones into bread (which we can now figuratively do), but after further reflection he gave up the idea because he saw that moral integrity and not more food was what was needed to make a better world. "Nothing less wide than a system of planetary ethics will suffice in so small a world as this."[9]

What can we as individuals do in this matter? As citizens we can keep as widely informed as possible; we can join with others to hold up the arms of our enlightened public servants, and by letter and ballot we can reproach those who support entrenched neofascist minorities. The "common man" should also not escape condemnation when he seeks selfish advantage; in a final analysis this war is only another convulsive episode in his struggle with those in every land who are trying to forge the shackles of a new feudalism. To be worthy of democracy the common man too must learn that freedom can not exist without social responsibility.

As teachers and investigators we must cultivate

[7] Editorial quotation, *Manchester Guardian Weekly*, 50: 15, 1944.

[8] John Brandt, *The Rotarian*, 64: 35, 1944.

[9] E. G. Conklin, "Man: Real and Ideal," Scribners, 1943, p. 195.

unprejudiced objective thinking in ourselves and in our students. We must emphasize the human side of science and its intellectual and social implications.

Since time began poets and seers have dreamed of a far-off divine event, toward which the whole creation moves. When that event does appear, better nutrition, as one of the fruits of real democracy, will have helped to ring in the thousand years of peace.

OBITUARY

HENRY ANDREW BUEHLER

IN the death of Henry Andrew Buehler, "The Chief," on March 14, 1944, the geological profession lost one of its older and most respected and honored members. His loss is one which will be most directly felt in Missouri, the State of his adoption, but will also be sensed throughout the mining world.

Buehler was born at Monroe, Wis., on May 27, 1876. He received the degree of bachelor of science in chemical engineering in 1901 at the University of Wisconsin. In 1925 the honorary degree of doctor of science was bestowed upon him by the Missouri School of Mines and Metallurgy of the University of Missouri. While in the University of Wisconsin he became acquainted and associated with E. R. Buckley, then state geologist of Wisconsin. When Buckley became state geologist of Missouri, Buehler became his assistant immediately after his graduation from college.

With the exception of one year (1907–08) when he was employed by the Federal Lead Company, Mo., he remained a servant of the State of Missouri throughout the remainder of his life. In 1908 Governor Joseph W. Folk appointed him state geologist of Missouri. The wisdom of this appointment and the service of the "Chief" is best exemplified by the fact that he was reappointed by each of nine succeeding governors. Few people knew his politics—no one cared. He was accepted as being above party lines.

Buehler's publications numbered thirty-four. The larger portion of these were "Biennial Reports of the State Geologist to the Missouri General Assemblies." His unselfish attitude toward his fellow employees and associates resulted in the publication of many of his ideas and theories by these associates. He thoroughly enjoyed and glorified in the inoculation of an associate with an idea and seeing it culminate in a research paper. Had he taken the selfish position of publishing the results of his research and direction, his bibliography would have been several times thirty-four. His early work as a geologist under Buckley left to the State of Missouri and the geological profession three reports that are still in demand; these are "The Quarrying Industry of Missouri," "The Geology of the Granby Area, Mo." and "The Lime and Cement Resources of Missouri." The first publication to be released under his direction as State Geologist of Missouri was the masterly treatise by his former master and predecessor, E. R. Buckley, "The Geology of the Disseminated Lead Deposits of St. Francois and Washington Counties, Missouri," 1908. The last publication released under his supervision was by his assistant, H. S. McQueen, "The Fire Clay Districts of East Central Missouri," 1943. Truly did the "Chief" administer and direct in preference to research and the accumulation of a large bibliography.

Buehler was creative and progressive. He never stopped planning and initiating new fields of research. The appropriations he obtained were always inadequate, but he made the most of them by cooperative programs with the U. S. Geological Survey. He early recognized the necessity for detailed topographic quadrangles and spirit leveling. This made it possible to complete a reconnaissance gravity survey of Missouri, which was recently published as a gravimetric map of the state. He believed in the use of all available methods of geological exploration and saw the completion of the magnetic survey of Missouri. The surface waters of the State were believed by him to be a part of its natural resources. An extensive cooperative program has resulted in the accumulation of valuable data on the discharge of all major streams and rivers in Missouri. The Cambro-Ordovician formations of the Ozarks were difficult to identify in cuttings obtained from drilled wells; at his suggestion a study was made of the insoluble residues from these formations. These residues were found to be sufficiently diagnostic to permit the identification of each formation. This principle has been well received and his laboratories became the mecca for geologists faced with this problem.

While being progressive and ever willing to test new theories and practices, Buehler was erroneously considered by some to be a conservative. Any semblance of conservatism on his part was due to the inadequacy of information presented with a new concept. If the facts established the concept, he accepted it regardless of how revolutionary it might have been. He was a firm and staunch supporter of E. O. Ulrich's "Ozarkian Period." He believed his friend Ulrich knew better than any geologist the formations assigned to this highly controversial group of rocks. He likewise believed the deposition of the lead and zinc sulfides in the Ozarks was due to the downward circulation of cold meteoric waters. He was never convinced that sufficient evidence had been presented to explain these

deposits by ascending magmatic waters. If the advocates of the latter theory had presented conclusive evidence to support their belief, he would have been among the first to accept it.

Every mineral industry in the State of Missouri felt the wisdom and influence of Buehler. His advice and counsel was in constant demand. Requests for information about mineral resources were given his personal attention. No task was too great if it involved the greater utilization of the mineral wealth of his State. The fruit of his life-long service and industry is testified by the fact that Missouri's mineral production in 1901 was less than $15,000,000, whereas in 1943 it approximated $75,000,000. There have been times when he was accused by promoters to be retarding the development of these resources because he would not recommend to the Missouri Securities Commission the authorization of the sale of stock on certain promotional programs.

Buehler could have used the services of a press agent. His modesty would not permit the publicity which was merited by his department. He enjoyed expressions of praise and appreciation of services rendered, but he wanted these praises spoken in a semi-private environment. He was sublimely happy when he was showing fellow geologists the interesting phenomena of his State. Frequently he directed extensive field conferences with more than 100 geologists in the party. On these occasions there were not enough hours in the day to satisfy him.

There was no man in the state of Missouri whose wisdom and counsel were in greater demand. A fellow state geologist has written: "I do not know of any of our fellow members (Association of American State Geologists) who has been more prominent in service to our states or occupied a higher place in the councils of the state government." He was a member *ex-officio* of the Missouri State Highway Commission; a member of the Missouri Planning Commission; the Missouri Resources Museum Commission; the State Commission of the New York World Fair of 1939 and the Golden Gate Exposition of 1939. At the time of his death he was in Jefferson City attending meetings of the Missouri Commission of Resources and Development and the Missouri State Highway Commission. In 1934–35 he was state engineer on the Civil Works Administration.

Dr. Buehler was a fellow of the Geological Society of America. He was an active member of the American Institute of Mining Engineers, serving as president in 1935. He was also a member of the American Association of State Geologists, the Society of Economic Geologists, The American Association for the Advancement of Science, the American Association of Petroleum Geologists, the Missouri Academy of Science, the Wisconsin Academy of Science, Arts and Letters, the National Research Council, the Highway Research Board, the State Historical Society of Missouri, Sigma Xi, Tau Beta Pi and Theta Tau.

Buehler was never married. He spread his devotion and affection on under-privileged children, civic enterprises and worthy students of the Missouri School of Mines and Metallurgy. The latter he referred to as "his boys" and he took great pride in watching them develop into leaders in the fields of mining and industry. The financial assistance he gave to "his boys" was in reality only a small part of their rich inheritance. The wisdom of his counsel, the devotion to his profession and the soundness of his philosophy of life were inspirational. He was a great teacher and minister although he refused to admit it.

Buehler was richly endowed with qualities that endeared him to all who knew him. His colorful and strong personality, straight thinking, utter frankness, genial friendliness, rough humor, code of ethics, originality, initiativeness and untiring devotion to assigned duties made him a man whose character, honesty and integrity were ever beyond reproach. His work is over, but his presence will continue to be felt.

EDWARD L. CLARK,
State Geologist of Missouri

OSCAR MILTON STEWART

OSCAR MILTON STEWART, who died in Columbia, Mo., on May 17, 1944, was one of the most widely known and esteemed American physicists of the passing generation.

His father was a Methodist minister. It has always been the policy of that denomination not to allow its preachers to stay very long at one point, and in that way it happened that the children of the family were mostly born in different places. Oscar's birth occurred at Neosho, Mo., on November 3, 1869. He attended DePauw University, where he took the degree Ph.B.; and later he went to Cornell University, where he received his Ph.D. in 1897. Years later, in 1938, DePauw gave him the honorary degree of D.Sc.

He was kept at Cornell University as instructor from 1898 till 1901, when he was appointed assistant professor of physics at the University of Missouri, which was then being radically improved under President Jesse. Shortly after 1901 he was made professor, though in fact he directed the affairs of the department for practically all the thirty-nine-year period preceding 1940.

In 1899 he married Miss Estelle Williams, of Ithaca. The couple had only one child, Lawrence. It was their misfortune to lose him in his early manhood. He was an early victim of the influenza epidemic of the first World War, at the Great Lakes Training Center. The

loss of this son was a severe blow, particularly to Mrs. Stewart, who never seemed in good health thereafter. She died shortly before the retirement of her husband, which occurred in 1940.

About the same time, Dr. Stewart's advancing age brought on vascular and cardiac troubles. He underwent one cerebral hemorrhage in 1941, and one or two more later. During the past eight months about one third of the time was spent in a hospital.

He published a number of research articles of value, but he was primarily a very successful teacher. His principal interests were in the philosophy and logic of physical science, but he also took a keen interest in practical applications. He had been a member of the American Physical Society since its organization, or nearly so, and a fellow for many years; also fellow of the A.A.A.S. and member of the Society for the Promotion of Engineering Education, Phi Beta Kappa, Sigma Xi, Tau Beta Pi and the social fraternity, Phi Kappa Psi. His college text-book of physics has been remarkably successful, and is one of the most carefully edited texts the present writer knows. He was also co-author of a successful high-school text.

In 1911 he collaborated with the firm of architects, Jamieson and Spearl, in designing the present Physics Building, which is probably the best-planned and best-constructed building on the campus.

Stewart was an excellent business man, and his personal fortune at the time of his death was considerable. His will leaves the bulk of the estate to the University of Missouri, with the stipulation that the interest shall be used for the benefit of the Department of Physics. Some latitude is permitted in the expenditure, but his expressed intention was that it should be used largely for scholarships to graduate or undergraduate students working in physics or for lectures by visiting physicists. This will no doubt be a fund of great value to the department.

Only two members of the original family survive. They are a brother, G. W. Stewart, who is well known to the physics fraternity as professor at the University of Iowa, and a sister, Mrs. E. L. Morgan, of Chesterton, Ind. Mrs. Morgan has been so kind as to give her deceased brother's considerable library to the department.

Professor Stewart's character was notable for a very high degree of modesty and almost limitless patience. He had many warm friends among the older group of physicists in the country as well as former students at Missouri. Those of us who have had the privilege of working with him for many years regret his passing very much indeed.

H. M. REESE

RECENT DEATHS

DR. LEONARD WHEELER ELY, since 1923 until his retirement with the title emeritus in 1934 professor of surgery at Stanford University, died on June 17. He was seventy-five years old.

DR. ROBERT A. HALL, chemist of the Colgate-Palmolive-Peet Company, died on June 15 at the age of fifty-eight years.

DR. HORACE CHAMBERLAIN PORTER, consulting chemical engineer of Philadelphia, died on June 15 in his sixty-eighth year.

SCIENTIFIC EVENTS

INDUSTRIAL RESEARCH COMMITTEE OF THE FEDERATION OF BRITISH INDUSTRIES[1]

THE Federation of British Industries has decided to strengthen its organization on the research side by making its Industrial Research Committee a permanent standing committee of the federation, with its own secretariat. By its terms of reference this committee will seek to stimulate national interest in research for industry and foster it in all appropriate ways. Thus it will encourage industrialists to devote a more adequate part of their resources to the promotion of research and its application to existing products and to the development of new products. It will provide money for the creation and maintenance of adequate facilities for postgraduate research; and encourage the education of the necessary research and development staff of universities, technical colleges and industrial establishments. The committee will promote contact and collaboration wherever possible between centers of industrial research or institutions and research workers; and facilitate cooperative research within British industry, with special reference to the needs of small-scale industries. Information on research questions will be provided by creating a liaison with appropriate reference libraries and technical and scientific institutions; and attention directed to the publications of professional, technical and scientific institutions, assistance being given where necessary in their distribution. The committee will promote the compilation of general information on industrial research, particulars of organizations and the facilities available; and provide from time to time information for press and public on the achievements of British industrial research.

[1] From *Nature*.

STANDARDS FOR PHOTOGRAPHIC CINEMATOGRAPHIC EQUIPMENT

A COMMITTEE of the American Standards Association to develop standards for important photographic and cinematographic equipment used by the armed forces, has been set up by the association at the request of the War Production Board on the initiative of the Army Pictorial Service. It includes representatives of the Signal Corps, Air Force, the Photographic Section of the Bureau of Aeronautics of the U. S. Navy, the Engineers Corps, the Marine Corps and manufacturers of photographic and cinematographic equipment. The Society of Motion Picture Engineers is represented, and the Research Council of the Academy of Motion Picture Arts and Sciences is being invited to appoint a representative.

R. B. Shepard, of the War Production Board, has been appointed chairman of the new committee. J. W. McNair, of the staff of the association, serves as secretary.

Following recommendations of the Armed Forces Committee under the chairmanship of Captain Lloyd Goldsmith, of the Army Pictorial Service, a number of projects has been undertaken. Probably the most important of these is development of a specification for a service model 16mm sound film projector.

The committee has made definite assignment of all projects requested by the Armed Forces to task committees, instructed to proceed with the utmost speed in the development of the specifications.

The projects include the following developments:

A standard specification for slide-film projectors, to include both manually and electrically operated projectors for 35mm slide-film and 2 × 2 inch slides.

A standard specification for measuring the performance characteristics of still camera shutters.

A standard performance specification including characteristics and methods of test for photographic exposure meters.

A performance and test specification for still picture contact printers.

A specification for 16mm motion picture test films.

A specification for standards of quality and control of processing and printing 16mm film.

A specification for the size and shape of 16mm and 35mm picture apertures of optical reduction printers and 16mm contact printers.

A specification for the size and shape of the photographic apertures of 16mm and 35mm motion picture cameras.

A specification for the size and shape of 16mm and 35mm motion picture camera view finder apertures.

A specification for a standard registration distance for 16mm and 35mm camera lenses.

A specification for a 35mm motion picture camera drive motor to operate from either 12 or 24 volts D.C. both of which voltages are used by the services.

A specification for camera noise measurements and acceptable limits for 16mm and 35mm sound motion picture cameras, sizes that are widely used in civilian life as well as by the services.

A performance specification for 16mm portable projection screen.

FELLOWSHIPS OF THE NATIONAL FOUNDATION FOR INFANTILE PARALYSIS

THE National Foundation for Infantile Paralysis has set aside the sum of $50,000 for fellowships in health education. Under this program, which has been developed in cooperation with the U. S. Public Health Service, qualified men and women will go into training beginning with this autumn.

Candidates for the fellowships will be selected by an advisory committee of the U. S. Public Health Service, and those accepted will be assigned to the schools of public health of Yale University, the University of Michigan and the University of North Carolina.

A bachelor of science degree, or its equivalent from a recognized college or university, is an essential qualification for one of these fellowships leading to the master of science degree in public health. Training will consist of nine months' academic work, followed by three months of supervised field experience.

Women between the ages of nineteen and forty who have the above educational qualifications and who are citizens of the United States are eligible. Men who are citizens over thirty years of age also may apply, and the War Manpower Commission has declared Selective Service registrants in 4F and 1AL classifications as eligible for these fellowships.

The fellowship provides a stipend of $100 monthly for twelve months, tuition and university fees to the school and expenses for field service. Applications can be obtained from the Office of the Surgeon General, U. S. Public Health Service, Washington 14, D. C. Applications must be accompanied by a transcript of college credits and a small photograph, and must be in the Office of the Surgeon General not later than August 15.

THE GIBSON ISLAND CONFERENCE ON CANCER

THE final program of the Conference on Cancer to be held at Gibson Island, Md., under the auspices of Section C of the American Association for the Advancement of Science, is as follows:

July 31

Albert Claude: Topography of Cell Function.

E. W. Shrigley and Francisco Duran-Reynals: The Biology of Virus-induced Tumors.

Alfred Taylor: Virus Production of Mammalian Tumors.

W. Ray Bryan and H. Kahler: Virus Studies with Newer Techniques.

August 1

John J. Bittner: Inciting Influences in the Etiology of Mammary Cancer in Mice.

H. B. Andervont: The Milk Factor in Breast Cancer in Mice.

Mary E. Maver: Serology of Tumor Cathepsins.

Jacob Furth: The Site and Time of Malignant Change in Leukemia of Mice.

August 2

F. H. J. Figge: The Relationship of Pyrrole Compounds to Carcinogenesis.

L. F. Fieser: Discussion of Hydrocarbon Carcinogenesis.

W. R. Earle: Production of Malignancy in Vitro.

Harry S. N. Greene: The Occurrence of Dependent and Autonomous Phases in the Development of Cancer.

August 3

R. J. Williams: B Vitamins and Cancer.

J. P. Greenstein: Enzymes and Cancer.

H. P. Rusch and C. A. Baumann: The Prevention of Experimntal Liver Tumors by Dietary Means.

August 4

Heron O. Singher: The Effect of Inhibitory Agents on Normal and Malignant Tissues.

Curtis Flory and Jacob Furth: Chemotherapeutic Studies on Leukemia.

The registration limit of seventy participants has now been reached. Further applications[1] must be taken on a waiting-list basis, in anticipation of possible cancellations. It is planned, however, to publish promptly the great majority of the papers as a special monograph in the series of symposium publications issued by the American Association for the Advancement of Science, similar to the earlier "Some Fundamental Aspects of the Cancer Problem" (Occasional Papers, No. 4, 1937). The monograph will also contain a record of the discussion, which will be taken down for the first time at these conferences. Funds for stenotyping have been provided for by a grant from the Jane Coffin Childs Memorial Fund. Additional written comments which the participants may care to submit will also be included. It is intended that the reports, papers, discussions and submitted comments will emphasize, so far as possible, the frontiers of investigation and the most recent experimental information available on the aspects of cancer considered.

DEAN BURK, *Chairman*
RALPH G. MEADER, *Vice-Chairman*

[1] For preliminary announcement, with details of registration, see *Chem. and Eng. News*, 22: 109, 1944.

SCIENTIFIC NOTES AND NEWS

DR. ALBERTO RECIO, Minister of Public Health of Cuba, has announced the opening on May 17 of the National Institute of Hygiene in Havana. On this occasion President Batista presented decorations of the order of Carlos J. Finlay to Brigadier General James S. Simmons, director of preventive medicine, Surgeon General's Office, U. S. Army; Colonel Harry Plotz, chief of the Division of Virus and Rickettsial Diseases, Army Medical School, Washington, D. C.; Dr. Rolla E. Dyer, director of the National Institute of Health, Bethesda, Md.; Dr. Reuben Kahn, of the University of Michigan; Dr. Henry Hanson, Commissioner of Health, Florida, and Dr. A. A. Moll, executive secretary of the Pan American Sanitary Bureau, Washington, D. C. At the same time the Cuban Government presented decorations to the Rockefeller Foundation, the American Public Health Association and a posthumous award to the American Yellow Fever Commission in honor of the great services rendered to yellow fever control.

DR. LILLIAN M. GILBRETH and Dr. Frank B. Gilbreth (posthumously) have been awarded the Henry Laurence Gantt Memorial Gold Medal for 1944 of the American Society of Mechanical Engineers "in recognition of their pioneer work in management, their development of the principles and techniques of motion study, their application of those techniques in industry, agriculture and the home, and their work in spreading that knowledge through courses of training and classes at universities." The medal is administered by the Gantt Medal Board of Award consisting of representatives of the American Society of Mechanical Engineers and the American Management Association.

THE Squibb Award of the Association for the Study of Internal Secretions was presented at the Chicago meeting on June 12 to Dr. Edward A. Doisy, professor and director of the department of biochemistry of the School of Medicine of St. Louis University, for his "contributions to scientific knowledge, particularly in endocrinology." The first award of the Ciba Pharmaceutical Company was presented to Dr. Edwin B. Astwood, assistant professor of pharmacotherapy at the Harvard Medical School, "for his contributions in the field of sex hormones and on the thyroid gland."

DR. HAROLD HENRY BEVERAGE, vice-president in charge of research and development of the Radio Corporation of America, has received a certificate of appreciation from the U. S. Army Signal Corps for his work in connection with the installation of a radio-teletype circuit in the North Atlantic. Major General H. C. Ingles, chief signal officer, made the presentation.

AT the commencement on June 24 of Bowdoin College the degree of doctor of science was conferred on Dr. Cornelius P. Rhoads, director of Memorial Hospital for the Treatment of Cancer and Allied Diseases, New York City.

CITATIONS as distinguished alumni were awarded on June 10 by the University of Chicago to Dr. Ralph W. Chaney, professor of paleontology, and to Dr. Leonard B. Loeb, professor of physics, both of the University of California at Berkeley.

DR. SANFORD B. HOOKER, of the School of Medicine of Boston University and the Evans Memorial Hospital, was the guest of honor at the first annual meeting of the American College of Allergists which was held in Chicago on June 10 and 11. The subject of his address was "Qualitative Differences in Canine Dander."

DR. ALFRED L. NELSON, chairman of the department of mathematics of Wayne University, Detroit, has been elected president of the Michigan Academy of Science, Arts and Letters.

THE honorary fellowship of the Royal College of Obstetricians and Gynecologists has been conferred on Sir Joseph Barcroft, until his retirement in 1937 professor of physiology at the University of Cambridge.

DR. ROGER IRVING LEE, practising physician of Boston, formerly professor of hygiene at the Harvard Medical School, was elected at the Chicago meeting president of the American Medical Association for the period 1945–1946.

OFFICERS of the American Society of Naturalists, elected by mail ballot, are: *President,* Dr. Fay Cooper Cole, Anthropology, University of Chicago; *Vice-president,* Dr. Charles W. Metz, Zoology, University of Pennsylvania; *Secretary,* Dr. Wm. Randolph Taylor, Botany, University of Michigan; *Treasurer,* Dr. M. R. Irwin, Genetics, University of Wisconsin (continuing); *Editorial Board, The American Naturalist,* Dr. Leon J. Cole, Dr. A. Franklin Shull and Dr. Laurence H. Snyder. The annual meeting will be held at Cleveland from September 12 to 24 in conjunction with the meeting of the American Association for the Advancement of Science.

DR. PAUL E. KLOPSTEG, formerly president of the Central Scientific Company of Chicago, who for the past two years has been chief of the Division of Physics of the National Defense Research Committee and assistant chief of the Division of Field Service of the Office of Scientific Research and Development, has been appointed director of research and professor of applied science to direct advanced studies and the coordination of research in the post-war period in the Technological Institute of Northwestern University. Dr. Klopsteg was a member of a committee, of which Dr. Charles F. Kettering was chairman, to advise the institute on post-war development.

DR. WM. H. EMMONS, who since 1911 has been chairman of the department of geology of the University of Minnesota and head of the State Geological Survey, and Dr. C. R. Stauffer, paleontologist, since 1917 professor of geology at the university, are retiring at the close of the academic year. Dr. Geo. A. Thiel has been appointed chairman of the department and Dr. F. F. Grout has become director of the Minnesota Geological Survey.

DR. WILLIAM WALTER GREULICH, professor of physical anthropology and anatomy and director of the Brush Foundation at Western Reserve University, has been appointed professor of anatomy at Stanford University.

DR. GEORGE F. PAPENFUSS, research associate in botany at the University of California at Berkeley, has been appointed, effective in July, assistant professor of botany.

DR. FREDERIC A. GIBBS, of the Harvard Medical School, has been appointed associate professor in the department of psychiatry of the Illinois Neuropsychiatric Institute of the College of Medicine of the University of Illinois, effective on September 1. Mrs. Frederic A. Gibbs has been appointed research assistant at the same institution.

DR. CHARLES MAURICE YONGE, professor of zoology at the University of Bristol, has been appointed regius professor at the University of Glasgow. He succeeds Professor E. Hindle, who has become scientific director of the Zoological Society of London.

DR. JOHN A. FARRELL has been appointed medical director of the John and Mary R. Markle Foundation.

DR. KENNETH H. DOAN, research associate at the Franz Theodore Stone Laboratory of the Ohio State University, has become associate biologist with the Fisheries Research Board of Canada.

DR. RICHARD H. BARNES, until recently assistant professor of physiological chemistry at the Medical School of the University of Minnesota, has been appointed head of the Department of Biochemical Research of Sharp and Dohme, Glenolden, Pa. He succeeds Dr. L. Earle Arnow, who was recently appointed director of research.

DR. CLARENCE COTTAM, biologist of the Fish and Wildlife Service of the U. S. Department of the Interior in charge of the section devoted to research on economic wildlife problems, has been appointed assistant to the director. He will serve as a coordinating and liaison officer in the field of wildlife conser-

vation and management in connection with other land-use agencies, particularly the Bureau of Reclamation, the Army Engineers of the War Department, the Tennessee Valley Authority and other Federal and State agencies.

DR. MORRIS A. STEWART, associate professor of parasitology at the University of California at Berkeley, is leaving to spend three months in Bolivia. He will have his headquarters in Santa Cruz, but will travel to remote parts of the country. His report on parasitic diseases and means for their control will be used by the Bolivian Government in its program for the economic development of the country. Dr. Stewart also will visit research laboratories in parasitic diseases in Mexico and the hospital devoted to the study of tropical diseases in Guatemala City. He will advise with the anti-plague service in Peru and will give lectures on malaria in Colombia.

THE Royal Caroline Institute, Stockholm, which is in charge of the Nobel Fund for Medicine, has decided to build a Medical Nobel Institute for research in anatomy, biochemistry and physiology. The new institute, according to *Nature*, will consist of three departments in one building to be erected on the premises of the new medical center at Norrbacka in the northwest region of the city. The Biochemical Nobel Institute was founded in 1937 and is directed by Professor Hugo Theorell. The physiological department will be a Neurophysiological Research Laboratory privately endowed in 1940 for Professor Ragnar Granit, who will also be in charge of the new institute. The anatomical department will be associated with a new chair in cell research to be founded for Dr. Torbjörn Caspersson.

THE Thomas W. Salmon Lectures for 1944 will be given in November at the New York Academy of Medicine by Brigadier John R. Rees, consultant psychiatrist to the British Army. His subject will be "The Shaping of Psychiatry by War."

DR. HUDSON HOAGLAND, executive director of the Worcester Foundation for Experimental Biology, gave the address at the spring initiation meeting of the Chapter of the Society of the Sigma Xi of the Worcester Polytechnic Institute. The title of the lecture was "Adventures in Biological Engineering."

DR. LOUIS S. GOODMAN, professor of pharmacology and physiology at the College of Medicine of the University of Vermont at Burlington, delivered on May 17 the annual Alpha Omega Alpha lecture of the College of Medicine of Syracuse University. He spoke on "Some Aspects of Recent Advances in Pharmacology."

THE Society for the Promotion of Engineering Education opened its fifty-second annual meeting on June 23 at the University of Cincinnati.

A UNIT of the Medical Research Council for research in applied psychology has been set up in the psychological laboratory of the University of Cambridge, of which Dr. F. C. Bartlett is the head. Dr. K. J. W. Craik has been appointed to the staff of the council as director of the unit. Members of the unit will undertake work elsewhere than at Cambridge, including investigations for the Industrial Health Research Board of the council.

IT is stated in *Nature* that the Rockefeller Foundation has made a grant of 15,000 rupees to the National Institute of Sciences of India, to give assistance in the publication of scientific papers in Indian journals. This grant is similar in character to that which has been made annually for some years by the foundation to the Royal Society to assist in the publication of scientific papers in Great Britain.

A WIRELESS to *The New York Times* states that, according to Professor Ugo Papi, general secretary, all property, including the archives of the International Institute of Agriculture at Rome, is safe. The German authorities did not deprive the institute of its diplomatic immunity, enjoyed since its founding in 1905 "for the protection of the common interests of farmers and for the betterment of their conditions after preliminary study of all requisite sources of information." During the enemy occupation the institute was allowed to continue as in peace time and representatives of principal nations at war against the Axis went on with their research unmolested. Since the Allied entry into Rome such of the institute's personnel as belong to enemy nations likewise have been respected.

THE *News Bulletin* of the Institute of International Education reports that the Pan American School of Agriculture, established recently at Zamorano, Honduras, for the study of scientific agriculture as applied to Central American conditions, has ended its first period of work with an enrolment of seventy-four students from five Central American republics. It was expected that the second session, which opened on June 1, the enrolment and the countries represented would show a considerable increase. The school is some twenty miles from the capital of Honduras and comprises 1,416 hectars of land in the valley of El Zamorano. The site was chosen after a careful consideration of its altitude, climate, irrigation facilities, quality of soil and other elements. The present agricultural course is for three years. Agricultural engineering is to be added to the curriculum later.

DISCUSSION

NOMENCLATURE OF THE RH BLOOD TYPES[1]

BASED on recent developments in the knowledge of the Rh blood types, certain changes in the nomenclature originally proposed by the writer[2,3] for the Rh agglutinogens and agglutinins appear desirable.

TABLE 1

ORIGINAL NOMENCLATURE OF THE RH TYPES AND THEIR DISTRIBUTION AMONG 871 WHITE INDIVIDUALS IN NEW YORK CITY

Classes	Reactions with antisera			Types		Reactions with antisera			Types	
	Anti-Rh*	Anti-Rh_1†	Anti-Rh_2‡	Designation	Frequencies per cent.	Anti-Rh	Anti-Rh_1	Anti-Rh_2	Designation	Frequencies per cent.
W	–	–	–	Rh negative	12.4	+	–	–	Rh	2.5
U	–	+	–	Rh′	0.8	+	+	–	Rh_1	53.6
V	–	–	+	Rh″	0.5	+	–	+	Rh_2	13.4
UV	–	+	+	Rh′Rh″	...	+	+	+	Rh_1Rh_2	16.8

* Standard anti-Rh agglutinin; corresponds with the original anti-rhesus serum of Landsteiner and Wiener, and gives about 85 per cent. positive reactions on bloods from white individuals (K. Landsteiner and A. S. Wiener, *Proc. Soc. Exp. Biol. and Med.*, 43: 223, 1940).

† Agglutinin anti-Rh_1 gives approximately 70 per cent. positive reactions on Whites (A. S. Wiener, *Arch. Path.*, 32: 229, 1941).

‡ Agglutinin anti-Rh_2 gives approximately 30 per cent. positive reactions on Whites (A. S. Wiener, SCIENCE, 98: 112, 1943; A. S. Wiener and E. B. Sonn, *Jour. Immunol.*, 47: 461, 1943). This agglutinin appears to be identical with the so-called anti-KJ agglutinin recently described in England (R. R. Race, G. L. Taylor, K. E. Boorman and B. S. Dodd, *Nature*, 152: 563, 1943).

In Table 1 is presented the former designations together with the frequencies of the types in a series of 871 white individuals. The new designations, given in Table 2, are suggested in order to overcome the following difficulties:

(1) The designation of type Rh in Table 1 is somewhat ambiguous because the term "Rh types" is usually used in a general sense. Therefore, I have adopted the suggestion of Race *et al.*[4] to designate this type as Rh_0,[5] and at the same time have changed the name of the standard anti-Rh agglutinin to anti-Rh_0, in order to make it correspond with its specific agglutinogen.

(2) The difficulty that the types Rh′ and Rh″ were not named after the antisera with which they react is now removed by naming the agglutinin giving 70 per cent. positive reactions anti-Rh′, while the agglutinin giving 30 per cent. positive reactions is named anti-Rh″. The designations of types Rh_1, Rh_2 and Rh_1Rh_2 still do not correspond with the antisera, but this is taken care of by the use of the alternative designations, Rh_0', Rh_0'' and $Rh_0'Rh_0''$, where these are necessary or desirable for the sake of clarity. Usually, however, the unambiguous and simpler designations, Rh_1, Rh_2 and Rh_1Rh_2, will still be found preferable.

TABLE 2

PROPOSED NEW DESIGNATIONS FOR THE RH BLOOD TYPES

Classes	Antisera			Designation of types	Antisera			Designation of types**
	Anti-Rh_0*	Anti-Rh′†	Anti-Rh″‡		Anti-Rh_0	Anti-Rh′	Anti-Rh″	
W	–	–	–	Rh negative	+	–	–	Rh_0
U	–	+	–	Rh′	+	+	–	Rh_1 (Rh_0')
V	–	–	+	Rh″	+	–	+	Rh_2 (Rh_0'')
UV	–	+	+	Rh′Rh″	+	+	+	Rh_1Rh_2 ($Rh_0'Rh_0''$)

* Anti-Rh_0 is the new designation for the standard anti-Rh agglutinin.
† Agglutinin formerly designated as anti-Rh_1.
‡ Agglutinin formerly designated as anti-Rh_2.
** Designations given in parentheses are optional and are to be used whenever necessary to avoid ambiguity.

Some confusion may result from the fact that sera containing the two agglutinins, anti-Rh_0 and anti-Rh′, and giving about 87 per cent. positive reactions, were formerly designated simply anti-Rh′. Such sera could now be designated as anti-Rh_1, so that the terms anti-Rh′ and anti-Rh_1 have been interchanged, and the same hold true for the terms anti-Rh″ and anti-Rh_2. All possibility of error can be avoided, however, if one designates the two sera containing two agglutinins as anti-Rh_0,Rh′ (or anti-Rh_0') and anti-Rh_0,Rh″ (or anti-Rh_0''), respectively, instead of using the shorter designations, anti-Rh_1 and anti-Rh_2.

[1] From the Serological Laboratory of the Office of the Chief Medical Examiner of New York City. Aided by grants from the United Hospital Fund and the Carnegie Foundation through the Committee on Human Heredity of the National Research Council.

[2] A. S. Wiener, *Proc. Soc. Exp. Biol. and Med.*, 54: 316, 1943.

[3] A. S. Wiener, E. B. Sonn and R. B. Belkin, *Jour. Exp. Med.*, 79: 235, 1944.

[4] R. R. Race, G. L. Taylor, D. F. Cappell and M. N. McFarlane, *Nature*, 153: 52, 1944.

[5] Interestingly enough, the identical idea occurred quite independently to the present author.

The six genes postulated under the author's theory of heredity are designated as *rh*, *Rh'*, *Rh''*, Rh_0,Rh_1 (or Rh_0') and Rh_2 (or Rh_0''), to correspond with the factors they determine. Incidentally, the frequency of type Rh_1Rh_2 given in Table 1 is slightly but significantly higher than that expected under the theory. While at first the writer was inclined to ascribe this to difficulties in the technic, this possibility has been ruled out by more recent studies. The excess of type Rh_1Rh_2 probably represents the effect of isoimmunization in pregnancy,[6] which would affect adversely principally infants of types Rh_1 and Rh_2. An observation favoring this idea is that the excess of individuals of type Rh_1Rh_2 is particularly pronounced in races characterized by large families and high infant mortality, *e.g.*, Chinese and Moslems.[7]

No attempt has been made to include the factor determined by the so-called anti-Hr serum of Levine and Javert[8] (or anti-St serum of Race and Taylor[9]) in the scheme. Levine believes that this factor is determined by a special allelic gene. However, unpublished observations by the writer indicate that this factor is related to the various Rh blood types in a manner analogous to that in which the factor detected by so-called anti-O sera is related to the A–B groups and subgroups (*cf.* Race *et al.*[4]). The observation that homozygous bloods of type Rh_1 fail to react with anti-St sera[9] can readily be explained in a manner similar to that proposed by the author to account for the behavior of anti-O sera.[10]

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NOTES ON STARRING IN AMERICAN MEN OF SCIENCE

IN accord with G. A. Miller's suggestion in SCIENCE for May 12 that Cattell's inauguration of a system of starring of scientists be discussed, and improvements on it suggested, excerpts are given from a study of starred psychologists[1] followed by some suggestions as to how the system of starring might be improved.

Cattell's inauguration of the system of starring the leading research workers in each of twelve fundamental sciences is considered by competent judges to have been a major contribution to the growth of research in America.

The star indicates that, in the private opinion of his peers, the starred psychologist is distinguished for psychological research. It implies either a large volume of good work or a considerable amount of especially original work. Of course it does not imply that the work done by others is not decidedly worth-while, but merely that it has not impressed the voters as quite so worthy of approbation.

The star is a recognition which not only gives the recipient satisfaction, but also increases his opportunities. It is a challenge to the recipient to continue his good work and to others who aspire to win this recognition. Vast amounts of good work have been completed as a result of this friendly rivalry. Many psychologists who are not starred feel confident that they are "as good a man as . . ." and consequently set out to prove it.

The good that starring does is increased by the widened knowledge as to who are starred and why. This widened knowledge not only encourages and puts the starred men more fully on their mettle, but it also attracts attention to their work and increases their opportunities for further research. It, moreover, augments the opportunities of promising persons not starred in the hope that, as a consequence of encouragement and improved facilities, they will win this coveted recognition. The various universities employing starred scientists are placing increased value upon this recognition as a proof of individual merit and institutional strength. They not only attempt to retain and attract men already starred, but also to have local men not yet starred win this high honor; to this end they often increase facilities and otherwise encourage their more promising men.[1]

SOME SUGGESTIONS

Objections to the system of starring which prevailed unaltered for 1908–1943 have largely been of five sorts. (1) Although in 1903 (when starring was first done) a large share of the scientists could be classified and rather fairly judged by the vote of leaders in one or another of twelve sciences, this is no longer true. Several additional sciences have become significant and specialization has interfered with many men feeling competent to vote on workers in allied disciplines. The fact that even some members of the National Academy of Sciences can not win a star because they are working in fields not recognized by Cattell in 1903 is a serious defect. Instead of 12 sciences, at least 20 should be recognized. (2) The number of men starred recently is too small. In 1903 the leading one fourth of all the scientists worthy of sketching in "American Men of Science" were starred. In the seventh edition of "American Men of Science" about 34,000 scientists are sketched, while only about 1,300 are starred. (250 newly starred, about 220 starred in 1937, about 200 starred in 1932, about 300 starred in 1921 or 1927 and the remainder starred in 1908 or 1903.) It appears that it is relatively fully 10 times as difficult to win a star now as it was in 1903. If instead of awarding stars to the top 25 per cent. of the scientists (as in

[6] *Cf.* A. S. Wiener, SCIENCE, 96: 407, 1942.
[7] A. S. Wiener, E. B. Sonn and R. B. Belkin, unpublished observations.
[8] C. T. Javert, *Am. Jour. Obstet. and Gynec.*, 43: 921, 1942.
[9] R. R. Race and G. L. Taylor, *Nature*, 152: 300, 1943.
[10] A. S. Wiener and H. E. Karowe, *Jour. Immunol.*, in press.
[1] S. S. Visher, *Am. Jour. Psychol.*, 52: 278–292, April, 1939.

1903), they were awarded to the top 10 per cent., the standard would remain sufficiently high. Yet on that basis, instead of 250 new winners each five years, there would be fully three times that number. (3) One of the unfortunate aspects of starring is that many men received almost enough votes to win a star. Such men may indeed be as worthy as some who received a few more votes and get starred. Perhaps if a symbol, perhaps an Indian arrowhead, were awarded to those who stood high enough in the opinion of the starred men (and others voting) to almost win a star, these men would be encouraged to increased effort. One result would be augmented research achievement. It is therefore suggested that, in addition to the one tenth starred, one tenth be given an arrow. (4) The original allotment of the 1,000 stars of 1903 among the sciences was based on the number of research workers in each. The proportion has changed greatly since then. For example, there are vastly more research chemists now than in 1903, and not many more anthropologists. Thus now a chemist has a far smaller chance of winning a star than an anthropologist. It is proposed that for each new edition of "American Men of Science" approximately the top 10 per cent. of each science be starred. Moreover, the second one tenth should receive public recognition, as by an arrow. Although stars won would not be deleted from the sketches, it is proposed that those won more than 15 years earlier be not counted in calculating the number of scientists eligible for a star. (5) The objections that stars are "undemocratic" and are too highly evaluated by administrators and others would be met somewhat by the proposed increase in their number and by the inauguration of the lesser recognition of an arrow.

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FISHERY DEPLETION

FOR over two years, a committee on depletion of the Fisheries Research Board of Canada has been functioning, with the undersigned as chairman. The increasing demand for fish for food as the war progresses has presented somewhat new problems in the use of this resource. The committee has attempted to clarify the situation as to greater production of fish, with the following result.

Depletion is often presumed when underproductivity of the fishery develops, that is, where the take in proportion to the effort fails to yield a satisfactory living to the fishermen. Usually such underproductivity develops sooner or later each year, which stops the fishery either automatically or by regulation based on experience. The fisherman then awaits natural replacement of the stock by the next year. If the stock of fish available is adequate, the remedy for underproductivity is improvement in fishing methods.

So long as the annual take corresponds with expectation based on past experience, the situation tends to be accepted without remark. Natural fluctuations in the abundance of the stock, which are largely of unknown origin, are quite usual and affect the take. When an increased take has continued for a number of years, it results in expectations of indefinite continuance. Then, a decrease in the take causes general complaint and an explanation is sought. Before attributing decreased annual productivity to overfishing, the possibility of natural fluctuation in stock being the cause should be excluded, which may be very difficult. Misinterpretation may lead to application of the wrong remedy.

Not infrequently intensive fishing is followed by a decrease in the average size of the fish. This may be merely the removal of an accumulated stock of very old fish and be irremediable except by reducing the fishing sufficiently to permit re-accumulation, which might be unwise. The amount not taken under the reduced fishing might be more than the gain through re-accumulation. If decrease in average size is accompanied by a decrease in production (weight of fish taken), it is often suggested that production could be increased if the fish were permitted to become larger by restricting fishing, particularly of the smaller fish. Carefully documented experiments with such restriction are desirable to establish it as wise procedure, since there are too many little known factors for any safe prediction of its effectiveness. Several such experiments are in progress.

Frequently the possibility is advanced that overfishing has resulted in under-replacement of the stock through decrease in the numbers of spawning fish. Since most species have a high reproductive capacity, this does not readily occur. Exclusion of anadromous fish from their spawning grounds by impassable dams definitely prevents replacement of the stock. Conceivably, overfishing might prevent full replacement of stock, but it is desirable to have carefully documented experiments to establish the need for restriction of the fishery to assure replacement. Leaving out of account such forms as the amphibious walrus of the Atlantic and fur seal of the Pacific, which are particularly vulnerable on their breeding grounds, we have as yet been unable to learn of a clear, documented case of under-replacement through overfishing for this continent. Information on this would be welcomed. It is proposed to undertake somewhat precise experiments to determine in particular cases how many spawners are required for replacement of the

stock, so that the full surplus may be taken for human use if desired.

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RESEARCH ON PHYSICAL CHEMISTRY IN THE U.S.S.R.

THE issue of *Zhurnal Fizicheskoĭ Khimii* (*Journal of Physical Chemistry*) 17: No. 5–6, 1943, released by the Academy of Sciences of the U.S.S.R. at the beginning of 1944, was received in this country a few days ago. This issue contains a review of the activities of the Karpov Institute of Physical Chemistry for the twenty-five years of its existence and carries an order of the Soviet government of October 20, 1943, decorating the institute, its director, Academician A. N. Bakh, and twenty-two co-workers for the proficiency and successes of their researches. Physical chemists will be interested in a bibliography given in that issue listing 825 publications of the Karpov Institute for the ten-year period 1933–1943, a substantial proportion of which are in English and German. The Karpov Institute comprises laboratories studying the following fields: (1) biological catalysis; (2) surface phenomena; (3) polymerization processes; (4) heterogeneous catalysis; (5) colloidal chemistry; (6) structure of matter; (7) chemical kinetics; (8) adsorption processes; (9) aerosols; (10) inorganic chemistry; (11) non-aqueous solutions; (12) solid and complex compounds; (13) x-ray; (14) physico-chemical methods of production control; (15) photochemistry; (16) technical electrochemistry; (17) a division exists known as the Kireev group.

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EDUCATION IN SCIENCE MUSEUMS; OR THE TEN PARTS OF THE FUNCTIONAL EXHIBIT

As the influence of the common man increases in world affairs, the extent of his knowledge and understanding will influence the future of all peoples. He can guard against emotional exploitation of his prejudices by developing critical habits of thought. He can build a barrier against rash judgments and actions by assembling within himself an understanding of man and the world around him. The education of the common man, on whose shoulders may hang the future of humanity, is a challenge to all museums of science.

Museums may meet this challenge with the functional exhibit. It portrays significant facts while impressing critical habits of thought on museum visitors; it compares a familiar with a strange way of satisfying a basic human need; it reveals truths discovered in the scientific search for ways to satisfy basic needs; it rouses curiosity; it stimulates the visitor to do something constructive with his learning.

There are fewer than fifty fundamental discoveries, from which man derives the millions of articles he uses to satisfy three basic needs. So the story of human progress can be told within the space of any museum, and even within the space of a single room, when this story is told through functional exhibits.

At the entrance to a science museum, which tells the story of human progress in functional exhibits, the visitor meets something familiar, perhaps a coin, a button, a light, actively doing something he readily understands, and in which he can easily take part. Compared with the familiar object is an unfamiliar one, used by strange people to meet the same need. This comparison stimulates curiosity and proclaims the main theme of the museum to be systematic comparison, which is also the crux of scientific thinking. After this friendly introduction, which rouses curiosity, stimulates critical thinking and does not block thought with enervating awe, the visitor is told what lays before him in the museum, what the museum aims to do, and why it will do just that.

At the start a frame is presented into which the visitor can fit what he knows and what he will learn. The visitor is told why men learn, to better satisfy their basic needs, and how the museum aims to aid that learning, by comparing primitive and civilized ways of satisfying basic needs and by tracing crucial steps in the evolution of the more effective ways. The visitor is told how to proceed through the museum to benefit most fully from it, to look at one exhibit at a time and understand it fully before advancing. The visitor is told to pick out of each exhibit a crucial fact and compare it with what he knows; he is told to challenge anything that differs from his own experience, accepting nothing on unproved authority. He is told to approach each exhibit with thoughts about it and it alone, which is the objective or problem attitude that psychologists have shown, in systematic experiments, produces the swiftest solutions to puzzles and problems. He is told to look in each exhibit for two ways of satisfying a basic need, and after comparing them decide which is best, and why. He is told where, in exhibits and in libraries, he may find facts that will answer his questions.

At the start and at strategic places throughout the museum, the visitor may be confronted with a chart of basic human needs, raw materials, main transforming processes—the fundamental ideas, discoveries and inventions by which man has created useful goods—and the main habits, customs and institutions through which these goods are controlled and used to satisfy common human needs. This chart, summarizing the

main facts of human progress, may focus the thoughts of the visitor on fundamental facts, as he tries on his way through the museum to integrate the numerous facts of separate exhibits into a pattern of significant knowledge.

Major themes may run throughout the exhibits of a great museum as they run throughout the movements of a great symphony. Two major themes for the functional exhibits of a science museum are: comparison, and value of facts in satisfying basic human needs. Each major theme may appear in each exhibit so the visitor may pick it up anywhere, no matter how widely he ranges or what order he takes in the exhibits. Minor themes, which are limited to single exhibits, tie the facts of the exhibit into something significant in the life of each visitor.

Each functional exhibit, which carries out two major and one or more minor themes, may consist of ten parts: (1) An experience common to all visitors, portrayed in a familiar object (*e.g.*, an electric torch) performing a familiar function (*e.g.*, lighting a path at night) by which visitors help satisfy a basic need (it makes the path a more predictable and a safer place on which to walk). The familiar object and way of satisfying a common need (*e.g.*, pressing a button to light a dark path) are (2) compared with a primitive tool and way of trying to satisfy the same basic need (*e.g.*, a reed torch used by the Loma in Liberian Africa).

The exhibit then traces the main steps of human progress in which man developed the familiar tool, by presenting (3) a fundamental idea (*e.g.*, freedom of search and expression which creates an atmosphere conducive to discovery), (4) a basic discovery (*e.g.*, electricity) and (5) crucial inventions (*e.g.*, the electric battery and generators, transmission of electricity by wires and resistance of some materials resulting in the electric light). The exhibit then presents the (6) main habits (*e.g.*, turning on a switch) customs (*e.g.*, politely shading the eyes of others from glare, reflected in the auto regulation controlling intensity and direction of headlights) and institutions (*e.g.*, laws, courts, patents) of control and use of the "tool" in satisfying a (7) basic human need (for predictable and favorable surroundings) and some advantages of the superior way of meeting the need (*e.g.*, the superior way of lighting a path at night produces less stumbling, fewer accidents and injuries).

The visitor indicates comprehension and alertness by (8) doing something about what has gone before (*e.g.*, presented with a question and a series of answers, the visitor may select a correct answer from the series before him by pressing a button or by some other action; the exhibit may then compliment him or, if he is in error, comment on his error and ask him another question). An arrangement, in which the visitor may participate, raises a question about the exhibit, and (9) indicates where an answer can be found in the museum, in a library or elsewhere. The exhibit ends by (10) stimulating the visitor to do something about what he has learned (*e.g.*, construct a toy, picture, poster or otherwise express a constructive reaction to what he has seen by describing in some way what he has learned for the benefit of others).

Learning from museum exhibits may be facilitated in a number of ways. The stimuli of the exhibit may be strengthened by tricks of lightning, use of colors and other art devices coupled with coordinated sounds and figures that move and speak. Movement not only of figures, but also of the background or the onlooker may enhance the effectiveness of the exhibit. Crucial meanings may be dramatized. Character portraits and personality profiles may help to impress ordinary visitors with the habits behind the triumphs and discoveries of critical thinkers. Plays, pictures and other artistic expression of the stories in exhibits may facilitate learning of the facts presented there.

Descriptive labels may tersely telescope thoughts pointing to crucial facts. Labels may also furnish the visitor with cross-indexes to sources and other aids to further search. The visitor should come away from each exhibit, and from the museum, thinking about a problem, its solution and its relation to larger problems, now before the citizens of the world.

Functional exhibits help the museum visitor understand strange ways of acting, strange habits, strange customs and strange institutions and strengthen within him constructive attitudes toward his neighbors. In functional exhibits numerous fundamental facts are related to three basic human needs and through them are related to each other, so they help create a reasonable uniformity of educated opinion, in spite of individual human differences. In comparing the ways in which men act functional exhibits may influence views of how men should act, and lay the groundwork of a scientific approach to the moral and political issues confronting mankind. None of the institutions of civilizations are better equipped than the science museum for educating the common man in the crucial facts of civilized life.

When science museums construct functional exhibits that rouse curiosity, encourage the making of comparisons and tell the story of human progress in significant patterns of crucial facts, then the museum will become the university for the common man, helping to shape the thinking and the future of all the peoples of the earth. This is worth doing.

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SCIENTIFIC BOOKS

OPTICAL ACTIVITY

Optical Activity and Living Matter. By G. F. GAUSE. No. 2 of a series of monographs on general physiology edited by B. J. Lujet. 162 pp. Normandy, Missouri: *Biodynamica.* $2.75.

THE author presents this monograph as a review of the widely scattered literature pertaining to the structure and the activity of living systems as related to the asymmetric configuration of their constituents. Thus, Dr. Gause's monograph covers a general ground in part identical with the subject of F. M. Jaeger's well-known treatise, "The Principle of Symmetry," and the same author's George Fisher Baker Lecture, "The Spatial Arrangements of Atomic Systems and Optical Activity." However, the two authors approach their subject from different angles. While Jaeger considers the symmetry relationships of static systems, Gause gives greater emphasis to the dynamic effects and in particular, to the dynamic biological effects of asymmetric systems.

The five chapters of Dr. Gause's monograph are preceded by a short introduction, in which the general principles and definitions are given. Here, Dr. Gause distinguishes between dissymmetry and asymmetry. In an attempt to overcome "some confusion in the terminology," he defines dissymmetry as the property of molecules possessing non-superimposable mirror-images, while he regards asymmetry as the property of molecular aggregates presenting a predominance of the right or the left form of dissymmetric molecules. Obviously, Dr. Gause's terminology will not remain unchallenged.

The first chapter deals with the optical activity of biological material. Asymmetry of molecular aggregates is regarded as a specific property of protoplasm and of living systems. The author forwards the thesis that the primary constituents of protoplasm such as the amino acids, the lecithins and the majority of the important sugars, occur in protoplasm in the form of only one of the optical isomers. They are obligatorily asymmetric and the author speaks of the exclusiveness of the asymmetry-sign in primary substances. Secondary substances, *i.e.*, substances possessing non-obligatory asymmetry, are said by Dr. Gause to be found in nature in the dextrorotatory as well as in the levorotatory form or as inactive racemates. It appears to the reviewer that it is not an easy task to agree upon an unambiguous definition by which primary and secondary biological substances can be distinguished. Amino acids, for example, are listed as primary substances. After the recent discovery of d-glutamic acid, d-proline, d-leucine, d-valine and d-phenylalanine as building stones of biological substances, do we now have to degrade amino acids to the rank of secondary substances? On the other hand, one may ask whether the distinction between primary and secondary protoplasmic constituents is concerned with optically active substances only and does not cover substances such as acetylcholine, pyruvic acid and certain optically inactive vitamins.

The second chapter is devoted to a discussion of origin and maintenance of optical activity. Here, the author illustrates the thermodynamic, kinetic and enzymologic aspects of one of the most attractive problems of biology. He does not fail to point out the gaps and inconsistencies, which, at the present state of our knowledge, still obstruct the clarity of our understanding. As to the origin of the initial optical activity of the components of protoplasm, Dr. Gause briefly presents the two principal theories: the asymmetric photochemical influence of terrestrial circularly polarized light upon racemates, on the one hand, and asymmetry as originating through fluctuations around the statistical mean value of equality of left and right isomers, on the other. Considerably more space is given to the mechanisms by which asymmetric syntheses are performed and optical activity is maintained in living matter at the present stage of evolution. Of the subjects and theories discussed by Dr. Gause in this connection, a few may be mentioned in this review. The interaction of two optically impure substances may, according to Langenbeck and Triem, lead to the synthesis of an optically active material of higher optical purity, when the reaction is interrupted before completion. Werner Kuhn's theory, ascribing the ageing of organisms to the progressive racemization of their optically active constituents, is also related. Another point is the production of an optically active substance from symmetric material, such as the formation of glucose and starch during the assimilation of carbon dioxide by green plants or the enzymatic synthesis of mandelic acid from benzaldehyde and hydrocyanic acid. However, all such asymmetric syntheses known to be performed by living matter depend upon the presence of optically active enzymes and the reviewer can not help but feel that these asymmetric enzymatic syntheses do not elucidate the mechanism by which the first optically active substance, after it had first been formed at the dawn of evolution and before any optically active enzyme existed, could have survived and transmitted its optical activity to other substances. Was the first optically active substance an enzyme and was it, at still an earlier period of evolution, preceded by optically inactive enzymes? Very recently, many proteolytic enzymes have been discovered which are adapted to substrates containing not *l*-amino acids but the "unnatural" *d*-amino acids. Are these *d*-enzymes remnants of such a hypothetical early period at which

each enzyme may have existed in equal quantities of its *d*- and *l*-forms?

Chapter III deals with heredity and the influence of environmental factors on the optical activity of biological material. First, several experiments are reported which the author presents as "proving the impossibility of inverting the optical properties of the primary constituents of protoplasm or of modifying protoplasm so as to cause it to invert the optical properties of the products of its metabolism." This is followed by a discussion of various mechanisms controlling the biological production of a given optical isomer.

Chapter IV deals with the relation between the inversion of spirally twisted organisms and the molecular inversion of their protoplasmatic constituents. The optical activities of protoplasmatic constituents in dextral and sinistral specimens of an organism have been found to be identical, *e.g.*, the same optically active forms of the various amino acids have been isolated from both the sinistral and the dextral forms of a snail.

In Chapter V, Dr. Gause discusses the asymmetric analysis of the mechanism of biological processes by the study of the differential influence of optical isomers. The author has applied this asymmetric analysis to the study of the mechanism of toxic action, to the evolution of the nervous system and to various physiological functions in protozoa.

In the last three chapters, the author moves in his own experimental field and, therefore, can draw from his own many experimental findings.

In a short appendix, the author discusses the structure of the cancer cell. He mentions the claim of Kögl and Erxleben to have isolated *d*-glutamic acid from malignant cells. The contradictory findings of Chibnall, of Graff and of Lipmann are also reported together with some other recent literature pertaining to this aspect of the cancer problem.

Dr. Gause's monograph presents in a rather limited space a great number of experimental results and theoretical data. It can be recommended as very stimulating reading.

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PLASTICS AND SYNTHETIC RESINS

A Laboratory Manual of Plastics and Synthetic Resins. By G. F. D'ALILIO. 134 pp. New York: John Wiley and Sons, Inc. 1943. $2.00.

DURING the past decade the literature covering all phases of the plastics industry has grown to such proportions that any one wishing to acquaint himself with the industry as a whole is likely to become lost in the details and references pertaining to the subject. Even those engaged in the industry are for the most part specialists in one or two branches of this highly diversified industry. Those engaged in the development of synthetic molding powder often know little of the field of surface coatings and the research worker who is thoroughly acquainted with the literature of phenolic resins may, for example, have but a nodding acquaintance with the theory of styrene polymerization.

As a quick ready reference for introductory methods for preparing the various synthetic resins of industrial importance, Dr. D'Alilio's "Laboratory Manual" will be an invaluable aid. Fortunately, the author has seen fit to limit the scope of this manual to experiments covering only those resins of recognized industrial importance and thereby avoiding the possibility of thoroughly confusing the student. Even so, the manual includes 40 synthetic resin preparations with accompanying experiments covering reaction variables and methods of product evaluation as surface coatings, adhesives, molding powders, plywood, synthetic rubber and others. On this basis the resins prepared from the original raw materials are used in successive evaluation experiments and for comparative tests with other resins to give the student a first-hand knowledge of the relative merits of the basic resin types covered.

A series of questions and added exercises follows each of the experiments. The questions are based on the assumption by the author that the student has had a course in organic chemistry, and while many of the answers to the questions lie within the experiment performed, the student will find it necessary to refer to the literature on the subject to check his conclusions. The suggested extensions of the various experiments are very comprehensive and explain why the field of plastics is one of specialization.

In addition to the series of 88 experiments, the author lists a series of 26 test methods. Some of these methods are straightforward organic test methods such as the determination of formaldehyde by the hydroxylamine hydrochloride or sodium bisulfite methods, but many of the methods listed are empirical ones developed by the industry to fulfil a definite need. The determination of the softening point and the rate of cure of resin are examples of such methods.

The author has also thoughtfully included in the appendix a list of the raw materials required for performing the various experiments and several sources for obtaining them. This is indicative of the thoroughness with which the "Laboratory Manual" has been compiled and thus it will not only admirably fulfil its intended function as a student laboratory manual but also aid those workers of the plastics in-

ustry who wish to become better acquainted with lastics other than those with which they are thoroughly familiar.

L. M. DEBING

MANOMETRIC MEASURES

anometric Methods. By MALCOLM DIXON. xiv + 155 pp., 20 figures. New York: The Macmillan Company. Cambridge: The University Press. Second edition. 1943. Price, $1.75.

THE manometric method, as embodied in the familiar Warburg apparatus, has become increasingly luable to the physiologist, biochemist and more recently to other classes of investigators, particularly od technologists who have been impressed with the rsatility of the technique.

Manometric manipulations, though exacting, are regarded by many with undue awe. On the other hand, ere are some who have used them without sufficient gard for the pitfalls which necessarily exist in a method so delicate. This excellent little book, now in its second edition, should be most helpful to both types of investigators. The author's object—to provide a handbook for the laboratory, supplying in convenient form just that information which is likely to be required by research workers using the methods—has been fully realized.

Part I of the book comprises a discussion of principles and includes a satisfactory account of the theory involved in each of the methods described.

Part II contains a detailed description of the main methods now available: the direct and indirect method of Warburg, the first and second methods of Dickens and Simer and the method of Dixon and Keilin. A brief outline of the micro-technique is also given.

The book might have been improved by a presentation of the recent work on new applications and a description of the excellent new equipment now commercially available.

CHARLES N. FREY

SPECIAL ARTICLES

ESSENTIAL FATTY ACIDS AND LIPOTROPIC ACTION OF INOSITOL

OVER a year ago the author became interested in the ssible effect of essential fatty acids on the lipotropic tion of choline. If choline lowers fat in the liver by rtue of its incorporation into the lecithin molecule, en essential fatty acids, which also constitute integral parts of this phospholipid, might similarly be quired before choline can exert this effect. A preliminary experiment of three weeks' duration, using s 100 to 125 grams in weight, suggested that the ential fatty acids were not required for the action choline, although the results obtained did suggest t choline decreases liver fat to a greater extent en these metabolites are present. However, the fference found was of questionable statistical significance. It was realized that the three-week period uld not have permitted a marked depletion of the imals' stores of essential fatty acids, and an experiment of longer duration was contemplated.

In the meantime Engel's paper[1] on the relation of essential fatty acids to the lipotropic action of oline was published. In an experiment of eight eks' duration performed on weanling rats, Engel nd that pyridoxine was required for the full lipopic action of choline. Because of the relationship pyridoxine and essential fatty acids in the cure of acrodynia, Engel determined under similar conions the effect of essential fatty acids on the lipopic action of choline. He found that they also gmented the lipotropic action of this substance.

An experiment of eight weeks' duration was devised to test the effect of essential fatty acids upon the lipotropic action of choline and also of inositol since it, too, is a constituent of certain phospholipids and its influence might be similarly affected by essential fatty acids in the diet. The basal diet chosen for this experiment consisted of 8 per cent. casein, 12 per cent. casein, 12 per cent. gelatin (both extracted with 1:1 alcohol-ether), 73 per cent. sucrose, 5 per cent. salt mixture, 2 per cent. agar, 0.015 per cent. vitamins A and D concentrate (Ayerst, McKenna and Harrison, containing 500,000 I.U. of A per gram and 50,000 I.U. of D per gram). A mixture of the B vitamins in the following amounts was injected daily in 0.5 ml physiological saline: thiamine chloride, 50 α, riboflavin, 25 α, pyridoxine, 20 α, calcium pantothenate, 100 α, nicotinic acid, 100 α. Twenty weanling rats of the Wistar strain (23 to 35 days old) were used for each group and litters were divided as evenly as possible amongst the different groups.[2] The groups were also balanced with respect to weight and sex. After eight weeks on the diet, the rats were killed by a blow on the head. Individual liver fats were determined in the usual way by saponification, acidification and extraction of the fatty acids with petroleum ether. Table 1 shows the results obtained.

This result supports Engel's statement that the lipotropic action of choline is increased in the presence of Mazola oil presumably through the action of essential fatty acids[1]. The lipotropic action of inositol on

[1] R. W. Engel, *Jour. Nutrition*, 24: 175, 1942.

[2] The mortality of the rats on the choline-free diets was quite high because of the development of hemorrhagic kidneys.

TABLE 1

EFFECT OF ESSENTIAL FATTY ACIDS ON LIPOTROPIC ACTION OF CHOLINE AND INOSITOL

Diet No.	Supplement per cent. of diet	Fatty acids per cent. liver weight
1. (Basal)	.....	23.4
2.	Choline chloride (0.5)	6.43
3.	Inositol (0.3)	13.3
4.	Mazola Oil (1.0)	25.3
5.	Mazola Oil (1.0) + Inositol (0.3)	27.2
6.	Mazola Oil (1.0) + Choline (0.5)	4.71

the other hand was obliterated by the inclusion of Mazola oil.[3] A possible explanation of this phenomenon might be that certain fatty acids in this oil make the diet more nearly adequate, increasing the demand for lipotropic factors and thus promoting a greater deposition of fat in the liver. But in view of the results with choline the writer believes that one must look elsewhere for the true explanation.

It is more probable that the nature of the fatty liver is changed in the presence or absence of the various supplements used. It will be recalled that choline has a relatively greater lipotropic effect on the "fat" fatty liver than on the "cholesterol" type of fatty liver, whereas with inositol, the reverse is true.[4] Only a complete analysis of the liver fats would reveal whether or not such a hypothesis is tenable. Fractionation of the fats from the livers of rats fed diets identical with those described above is now in progress and the results will be published shortly.

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STUDIES ON THE TOXICITY AND ACTIVITY OF STREPTOTHRICIN

IN 1941 Waksman and Woodruff[1] reported on the isolation and properties of streptothricin, a bactericidal substance obtained from a soil organism named *A. lavendulae*. Recently, Foster and Woodruff[2] published on the *in vitro* action of streptothricin against bacteria, fungi and yeast. However, with the exception of a short note published by Metzger[3] on the action of this agent in experimental brucellosis, nothing has appeared in the literature regarding the *in vivo* activity or toxicity of this substance. The present communication is mainly concerned with these factors.

[3] Preliminary results of current investigations indicate that the substitution of a fat devoid of essential fatty acids does not interfere with the lipotropic action of inositol.

[4] G. Gavin, J. M. Patterson and E. W. McHenry, *Jour. Biol. Chem.*, 148: 275, 1943.

[1] S. A. Waksman and H. B. Woodruff, *Proc. Soc. Exp. Biol. and Med.*, 49: 207, 1942.

[2] J. W. Foster and H. B. Woodruff, *Arch. of Biochem.*, 3: 241, 1943.

[3] H. J. Metzger, S. A. Waksman and L. H. Pugh, *Proc. Soc. Exp. Biol. and Med.*, 51: 251, 1942.

EXPERIMENTAL

Materials: The streptothricin[4] used varied in potency from 5,000 to 300,000 units[5] per gram of solid. The drug is readily soluble in water, and was administered as an aqueous solution. The mice used were of the CFI strain and weighed between 18 to 21 grams each.

Toxicity Studies: These experiments were performed in mice by administering single doses of streptothricin intravenously, subcutaneously and by mouth. The dose levels employed and the data obtained are presented in summary form in Table 1. Mice injected intravenously or subcutaneously with dose levels of 30,000 units per kgm produced no evidence of toxicity throughout the five-day observation period. Dose levels of 60,000 units/kgm (approximately 10 to 12 times the effective dose) produce some deaths when given by vein, but no untoward effect by the subcutaneous or oral route. Large doses by the subcutaneous route produced toxic signs in mice. Streptothricin was well tolerated when given by mouth in that single doses of 250,000 units per kgm appeared

TABLE 1

ACUTE TOXICITY OF STREPTOTHRICIN FOR MICE

Dose in units/kgm	No. of mice/dose	Per cent. mortality (5 days observation) i.v.	s.c.	oral
30,000	10	0	0	0
60,000	10	20	0	0
125,000	10	20	30	0
250,000	10	80	100	0
500,000	10	100	100	10
750,000	10	...	...	30

TABLE 2

BACTERIOSTATIC ACTION OF STREPTOTHRICIN IN AGAR

Organism	Units per cc of agar required to produce complete inhibition
Strep. hemolyticus 1685	32
Strep. hemolyticus MIT	256
Strep. hemolyticus M	256
Strep. viridans	> 1024
Strep. lactis	> 1024
Staph. aureus SM	16
Staph. aureus FDA	128
Staph. aureus SD	128
Staph. aureus 155	128
Diplo. pneumoniae Type I	32
B. mycoides	1024
B. subtilis	32
E. typhi	4
S. aertrycke	16
S. enteritidis	64
S. schottmülleri	16
B. flexneri	32
B. sonne	128
P. lepiseptica	32
B. proteus	512
B. pyocyaneus	256
N. meningitidis	256
E. coli	16
S. leutea	256
A. aerogenes	256

[4] The streptothricin employed in these studies was obtained from the chemists of the Research Laboratories of Merck and Co., Inc., from cultures grown by Dr. J. W. Foster.

[5] A unit of streptothricin is the minimum quantity of drug which when added to 1.0 cc of nutrient broth will inhibit a given strain of *E. coli*.

to be without effect on mice. However, when sufficiently large doses (500,000 units/kgm) were given, signs of anorexia, accompanied by a gradual loss of weight, developed in most animals, and 10 per cent. of the mice died.

Efficacy: In vitro studies performed by incorporating streptothricin in melted blood agar and streaking the surface of the solidified agar with a variety of pathogenic bacteria, show this substance to be highly effective against organisms of both the gram-negative and gram-positive group (Table 2). Organisms of the colon-typhoid group and the Salmonella group are particularly sensitive. Thus quantities as small as 4 units per cc of agar were sufficient to inhibit completely the growth of *E. typhi.* Certain strains, such as *B. pyocyaneus* and *B. proteus, S. viridans* and *S. lactis,* were highly resistant to streptothricin.

The *in vivo* experiments were performed with a number of gram-negative and gram-positive pathogens. Infection was produced by intraperitoneal injection of 10,000 lethal doses of the test organisms, and treatment, initiated immediately after the infection, was given intravenously, intraperitoneally, subcutaneously and by mouth. Therapy consisted of either a single or repeated doses, the latter varying from once every six hours to once daily over a five-day period.

The results obtained with a number of the gram-negative organisms were of the same order, and therefore only the findings with a single test organism are presented in Table 3.

Streptothricin in single doses of 50 to 100 units per mouse (2500 to 5000 units/kgm) given intravenously or subcutaneously shortly after the bacterial inoculation afforded excellent protection against *S. schottmülleri* infections. Smaller amounts given intraperitoneally protected a large percentage of the mice. Similar results were obtained with strains of *S. aertrycke, E. coli and B. shigalis.* When administered by mouth, streptothricin was much less effective than following parenteral therapy. Doses of 3,000 units per mouse were required by mouth to afford the same protection as 100 units by vein or by the subcutaneous route. Repeated doses of streptothricin appeared to offer no great advantage over the single dose therapy, although in the lower dose levels the best results were obtained by administering the drug every six hours.

TABLE 3

EFFICACY OF STREPTOTHRICIN IN MICE INFECTED WITH S. SCHOTTMÜLLERI
(SUBCUTANEOUS THERAPY)

Organism: *Salmonella schottmülleri.*
Age of Culture: 6 hours.
Infection: 0.5 cc of a 10^{-5} culture dilution in 4 per cent. mucin.
Therapy: Streptothricin given subcutaneously immediately after bacterial inoculation.

No. of mice	Drug	Units/dose	No. of doses/day	Culture dilution	No. surviving in days								Per cent. survival
					1	2	3	4	5	6	7	8	
				(Therapy: A single dose)									
30	Strepto-	12.5	1	10^{-5}	3	0	0	0	0	0	0	0	0
65	thricin	25.0	1	"	25	23	18	16	15	15	15	14	21.5
65		50.0	1	"	49	44	43	41	37	37	34	34	52.4
65		100.0	1	"	65	62	62	60	59	59	59	59	90.8
35		200.0	1	"	35	35	35	35	35	35	35	35	100.0
				(Therapy: Single Daily Doses over a 5-day period)									
20	Strepto-	12.5	1	10^{-5}	2	1	0	0	0	0	0	0	0
20	thricin	25.0	1	"	9	5	4	3	1	1	1	1	5
20		50.0	1	"	18	13	12	12	12	11	11	11	55
				(Therapy: Every 6 hours over a 5-day period)									
20	Strepto-	12.5	4	10^{-5}	20	4	3	3	3	3	3	3	15
20	thricin	25.0	4	"	20	6	3	3	1	1	1	1	5
20		50.0	4	"	20	20	20	20	20	20	20	19	95
20		100.0	4	"	20	20	20	20	20	20	20	20	100
				(Therapy: None)									
65	Controls	....	..	10^{-5}	6	1	0	0	0	0	0	0	0
30	"	....	..	10^{-6}	3	0	0	0	0	0	0	0	0
30	"	....	..	10^{-7}	16	10	7	5	3	3	3	3	10
30	"	....	..	10^{-8}	16	9	8	7	6	6	6	6	20

Certain gram-negative organisms and most gram-positive species were quite resistant to the action of streptothricin *in vivo.* The course of the infection in mice produced by strains of *B. pyocyaneus, B. proteus, Staph. aureus* and *D. pneumoniae* was not markedly influenced by streptothricin, even when doses approaching the toxic range were administered. Likewise, streptothricin had no significant influence on the virus of epidemic influenza or on *Trypanosoma equiperdum* infections in mice.

SUMMARY AND DISCUSSION

The foregoing experiments indicate that crude streptothricin is markedly effective *in vitro* against many gram-positive and gram-negative organisms. Furthermore, mice heavily infected with a variety of gram-negative organisms are completely protected by

the administration of small amounts of streptothricin. The drug is more effective parenterally than when given orally. However, preliminary experiments show that streptothricin by mouth greatly reduces the lactose fermenting bacteria of the intestinal tract. In this respect the drug is similar to certain sulfonamides and suggests, therefore, that streptothricin may be of value in bacillary dysentery and typhoid fever. The marked effect of streptothricin *in vitro* against gram-negative and gram-positive organisms, coupled with the fact that body fluids have no apparent inhibitory effect on the action of streptothricin, suggest that the crude drug might be of great value in infected wounds and burns.

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THE TIDAL AIR OF LABORATORY ANIMALS[1]

BECAUSE of the increasing need for information concerning the tidal air of laboratory animals we desire to present a general formula for such a determination on resting and fasting animals and to present the results of experimental tidal air determinations under conditions more nearly resembling those found during inhalation experiments with infectious nuclei.

In determining the tidal air by formula it must be assumed that animals use up the same proportion of oxygen from the air as man, *i.e.*, approximately 5 per cent. Thus, animals under basal conditions inspire 20 liters of air for each liter of oxygen consumed. The oxygen consumption in 24 hours in animals and man can be estimated from the basal heat production which for warm-blooded animals from rats to steers averages ($72\ W^{3/4}$) calories, where W is the body weight in kilograms.[2] Since one liter of oxygen consumed by fasting animals represents 4.7 kilocalories of heat, the basal rate of oxygen consumption amounts to $\frac{72}{4.7} W^{3/4} = 15.3\ W^{3/4}$ liters of oxygen per day, or $306\ W^{3/4}$ liters of air per day, or $\frac{306 \times 1000}{1440} W^{3/4} = 212\ W^{3/4}$ cc of air per minute.

To determine the tidal air of 27-day-old albino Swiss mice under conditions more nearly approaching those found during inhalation experiments in which the mice are not at a basal condition, respiration trials were made in an apparatus previously described by Kleiber.[3] Animals were taken from a large cage containing food and water, divided into 7 groups of 10 mice each, and then placed in the respiration cages. The temperature during the run was 30° C. The mean metabolic rate of the animals during the whole trial (3 hours) was 119 kilo-cal./day/$Kg^{3/4}$; for the third hour only it was 97 kilo-cal./day/$Kg^{3/4}$. The mean weight per mouse at the end of the trial was 10.5 ± 0.25 gms. By the use of the formula, resting and fasting mice of 10.5 gms weight are calculated to have a tidal air of 7.0 cc per minute.

The tidal air of these animals as calculated from the metabolic rate was obviously decreasing from the start of the fast, as shown by the following figures.

Time in hours from start of fast	Mean tidal air per mouse per minute, in cc's
0.5	15.0 ± 0.8
1.0	11.7 ± 0.8
1.5	10.8 ± 0.7
2.0	10.5 ± 0.5
2.5	8.7 ± 0.3
3.0	9.3 ± 0.4

Some of the high rate in the initial half hour may be due to the effect of handling of the animals, but it is believed that the fasting was an important factor in the observed decrease. These data are comparable to the results of Loosli, Robertson and Puck[4] who used heavier, partially anesthetized animals and a different technique.

In some recently published experiments[5] we had occasion to determine the tidal air of a 3.5 kg *Macaca rhesus* monkey under intravenous pentabarbital anesthesia by means of a tracheal canula attached to a respirometer. Under deep anesthesia, when the respirations were shallow, three respirometer trials averaged 546 cc of air per minute. A resting and fasting monkey of the same weight would have a tidal air of 543 cc per minute as determined by the formula.

The basic heat formula is a useful tool for those interested in the biology of respiratory infection since the tidal air of any laboratory animal can be quickly estimated if the weight is known. The data presented point out the need of having animals in a basal state in order to reduce the number of variables in inhalation experiments.

THE PERSONNEL OF U. S. NAVY MEDICAL RESEARCH UNIT NO. 1
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[1] The opinions advanced in this paper are those of the writers and do not represent the official views of the Navy Department.

[2] M. Kleiber, *Hilgardia*, 6: 315, 1931.

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A NEW MALE-STERILE MUTANT IN THE TOMATO

HETEROSIS, expressed in increased yield and earlier fruiting, has been frequently demonstrated in first-generation hybrids between certain horticultural varieties of *Lycopersicon esculentum* Mill.[1] The labor required to emasculate and pollinate flowers for the production of hybrid seed has heretofore prevented the widespread horticultural exploitation of this phenomenon. Barrons and Lucas[1] describe certain simplifications of technique that would reduce the amount of necessary labor. They also make a suggestion: if a male sterile type were used as the female parent in a program of cross-pollination, the need for emasculation would be eliminated. Currence[2] proposes for the same purpose the use of a type which has a stigma exserted beyond the anther tips and which therefore, when artificially pollinated without emasculation, yields a large percentage of hybrid offspring.

An unfruitful plant discovered here by Dr. Paul G. Smith was found to owe its barren condition to male-sterility. This plant and its male-sterile offspring are characterized and readily identified by anthers lighter in color and variously more shrunken than the anthers of male-fertile plants. The sporogenous tissue of male-sterile anthers develops normally until the formation of PMC's. Because further development is halted, as testified by the absence of all meiotic figures save the earliest stages, no pollen is produced. Fertility of the ovules is impaired only slightly if at all by the male-sterile genotype: the mean number of seeds per fruit produced by hand pollinations on five male-sterile plants—86—compares favorably with the mean number—91—observed in similar treatment of eight male-fertile sibs.

TABLE 1

SEGREGATION OF MALE-STERILITY IN F_1, F_2 AND BACKCROSS PROGENIES

Progeny No.	Nature of pedigree	Male fertile plants		Male-sterile plants	
		Obtained	Expected	Obtained	Expected
L1	F_1	25	25	0	0
L1	F_2	29	26.25	6	8.75
L12	F_2	14	15	6	5
L16	F_2	28	27	8	9
L24	F_2	22	24	10	8
L11	m.s. $F_2 \times F_1$	7	8.5	10	8.5
L2	male-sterile F_2 × male-fertile F_2*	19	18	17	18
L5		14	13	12	13
L6		12	12.5	13	12.5
L8		49	49	0	0
L18		15	16	17	16
L20		16	18	20	18
L21		27	27	0	0

* These are essentially backcrosses planned to determine the genotype of seven random F_2 male-fertile plants.

The transmission of this character to F_1, F_2 and backcross generations, summarized in Table 1, argues recessive monogenic determination and an equal viability of male-sterile and male-fertile phenotypes. This male-sterile type could therefore be readily propagated from seed by backcrossing heterozygotes to male-sterile individuals.

Where hand-emasculated male-fertile plants are used in the large-scale production of hybrid seed, a considerable risk of contamination by self-pollination might be encountered, because any flower accidentally overlooked would produce seed by self-pollination. In contrast, the only source of contamination involved in the use of male-sterile plants is natural crossing. This factor is inconsequential according to Jones,[3] Lesley[4] and Currence and Jenkins[5]; in the present studies not a single fruit was set by open-pollination on six male-sterile plants growing during the summer of 1943 among male-fertile sibs.

The male-sterile tomato reported by Lesley and Lesley[6] differs in two respects from the one reported here: it is determined by two or possibly three factors, and it produces morphologically normal but non-germinable pollen and so is less readily identified. This difference in expression and inheritance points to a different genetic basis of these two mutants.

The writer has observed that mutations to male-sterility occur often enough to warrant search for them in any desired variety. The nearly exclusive propagation by self-pollination in the tomato favors the appearance of viable recessive mutants. Furthermore, when plants are unfruitful by virtue of genetic male-sterility or any of several other cytogenetically conditioned sterilities, their very aggressive vegetative habit renders them conspicuous in fields late in the harvest season. Accordingly, a large number of sterile plants can be readily obtained, and the male-sterile mutants among these can be identified by cytogenetic tests. This method of securing male-sterility in a given variety is believed to be more efficient than the customary procedure of backcrossing a male-sterile mutant to the desired variety. Three varieties of tomato were scanned in this manner for male-sterile types in 1943; and, with comparative ease, morphologically male-sterile types were found in each variety.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A SIMPLE DROP RECORDING SYSTEM

MANY types of drop recorders have been devised. Most are difficult to maintain. Some utilize the force of the falling drop, while others utilize the conductivity of the drop to complete an electrical circuit. With the usual arrangement in the case of the latter a sensitive relay is required to actuate the recording device.

By the use of a bell-ringing transformer actuated by house current in place of the relay, the apparatus becomes entirely free of troublesome contacts and moving parts. This has the advantages of being simple, non-mechanical, sensitive to electrolyte solutions of low concentration, easy to construct and maintain, and useful under a wide variety of conditions. It is made of a few common pieces of inexpensive and readily available equipment.

The electrode gap of a conventional falling drop "capsule" such as that described by Gibbs[1] is arranged in series with the primary of an ordinary A-C bell-ringing transformer and a 110 V A-C source; the 6-10 volt secondary actuates the recording device. The drop (1 per cent. NaCl solution) closes the electrode gap in the primary circuit. It is displaced from a flask of suitable size by the fluid whose rate of flow is being studied. The fluid system is closed and air excluded from it. There is virtually no evolution of gas at the primary gap because of the alternating character of the current. Considerable dilution of the electrolyte solution is possible before effective conductivity is impaired.

In classroom demonstrations, the kymographic record of the drops is not clearly visible to students at a distance. Therefore in demonstrations we also use an electric light bulb which flashes when contact is made. This is provided by placing a 7½ watt 110 V lamp between the electrode gap and the transformer primary, in parallel with the primary.

STEPHEN KROP
WALTER MODELL
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A SIMPLE METHOD FOR QUIETING PARAMECIUM AND OTHER SMALL ORGANISMS DURING PROLONGED OBSERVATION

Paramecium is notoriously difficult to immobilize while alive. This is evidenced by the papers of J. S. Lee[1] and J. B. Buck[2] presenting beautiful though somewhat elaborate methods to bring this animal under control.* Consequently it seems worth while to record a very simple but effective technique adapted from Lieutenant W. G. Downs,[3] who originated the method in connection with preserving Giemsa blood films and quieting mosquito larvae.

A solution of completely hydrolyzed, medium viscosity polyvinyl alcohol is prepared by stirring the powdered alcohol into water until the solution is as thick as heavy molasses—approximately 12 to 14 grams of dry alcohol in 100 cc of water. This should be done over a steam bath and the solution left until all bubbles rise to the surface after which the solution will be glass clear. The solution should then be poured into a wide-mouthed stoppered bottle where it will keep indefinitely. The above holds for "Type B Grade RH-349-N" available at about $1.00 a pound from the E. I. du Pont de Nemours Company, Electrochemicals Department, Niagara Falls, N. Y. Other forms of polyvinyl alcohol, e.g., grade "RH-349-N," can be used but go into solution with much more difficulty and remain cloudy.

In use, two drops of a thick suspension of paramecium, as from a rich boiled lettuce culture,[4] are placed on a slide and two drops of the polyvinyl alcohol solution added. The whole is thoroughly stirred with a needle and covered with a cover glass. The animals are brought almost to a standstill at once and will remain so in good condition for over four hours. Abrupt and striking reversals of ciliary beating and many other details are clearly visible. The frequency of pulsation of the contractile vacuole usually becomes slower after three hours. The cover glasses are self-sealing because the polyvinyl alcohol dries to form a firm membrane that prevents further evaporation. The slides can be cleaned merely by soaking briefly in water.

Stentor coeruleus presents a handsome object when immobilized by this method. The same holds for the larger hypotrichs and various small aquatic oligochaetes like *Nais* and *Chaetogaster*.

G. B. MOMENT
GOUCHER COLLEGE

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BOOKS RECEIVED

BABKIN, B. P. *Secretory Mechanism of the Digesti Glands.* Illustrated. Pp. xix + 900. Paul B. Hoeb Inc. $12.75.

BEST, CHARLES HERBERT and NORMAN BURKE TAYL *The Living Body. A Text in Human Physiology.* vised Edition. Illustrated. Pp. xxii + 571. He Holt and Company, Inc. $3.90.

COOLEY, R. A. and GLEN M. KOHLS. *The Argasidae North America, Central America and Cuba.* American Midland Naturalist, Monograph No. 1. lustrated. Pp. 152. The University Press, No Dame.

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SCIENCE NEWS

Science Service, Washington, D. C.

MEXICAN ASTRONOMICAL EXPEDITION TO OBSERVE THE TOTAL SOLAR ECLIPSE

AN expedition of leading Mexican astronomers will observe the total eclipse of the sun on January 25 from Peru, and the party is now *en route* on board a Mexican warship.

Headed by Dr. Joaquin Gallo, director of the Mexican National Observatory at Tacubaya, the group also includes Dr. Luis Enrique Erro and Dr. Carlos Graeff Fernandez, director and assistant director of the newly established Astrophysical Observatory at Tonanzintla, in the state of Puebla. Both observatories have provided instruments and equipment, which includes modern eclipse cameras and spectrographs.

The eclipse expedition has the joint sponsorship of the Mexican federal government, the state of Puebla and the University of Mexico. The initiative for the expedition came from Dr. Gonzalo Bautista, governor of Puebla, who has also sponsored the Tonanzintla Observatory, which has had the cooperation of Harvard Observatory. President Avila Camacho has aided the plans on behalf of the federal government and Ambassador Luis Fernan Cisneros of Peru promised a welcome from that country to the Mexican astronomers.

The instruments will be set up at Cajamarca in Peru, well within the narrow path of total darkness created by the moon coming between the sun and the earth.

The voyage to Peru from an unannounced Mexican port will be a training cruise for Mexican midshipmen as well as an astronomical trip.

Because of war conditions it is expected that the eclipse of January 25, whose totality extends across South America through Brazil and Peru, will be poorly observed. So far as known, there will be no eclipse expeditions from the United States.

This will be Dr. Gallo's third eclipse expedition, as he went to the 1905 eclipse in Spain as a member of the Mexican expedition to that eclipse. When in 1922 a total eclipse was visible in northern Mexico, Dr. Gallo was at the head of a Mexican expedition that cooperated with U. S. parties from north of the border.

Astronomical expeditions from Mexico date back to 1769, when the Mexican astronomer Joaquin Velazquez de Leon joined French and Spanish expeditions in Lower California to observe the famous transit of Venus. In 1874 Mexico sent another transit of Venus expedition to Japan, which was headed by Francisco Diaz Covarrubias, founder of the National Observatory.—AUGUSTIN ARAGON LEIVA.

THE VAN GENT COMET

CALCULATIONS received at the Harvard College Observatory from South African astronomers confirm the belief that the comet recently found in the constellation of Aquarius, the water-carrier, by Leslie C. Peltier, an American amateur astronomer, is the van Gent comet. This comet was discovered near Nova Puppis late in November by Dr. H. van Gent, of the Union Observatory at Johannesburg, South Africa.

The comet follows a parabolic orbit, according to a report from Dr. J. W. Jackson, director of the Royal Observatory at the Cape of Good Hope, and Dr. W. H. van den Bos, director of Union Observatory. It is estimated that the comet will be nearest the sun early on the morning of January 12.

The new-found comet will probably be visible in the constellation Aquarius to observers with binoculars for some time, due to its motion northward. Northern astronomers, at the time of its discovery, thought the comet to be heading too far south for them to see it at this time. The path of the comet across the sky has apparently curved northward.

The positions which the comet was expected to occupy were worked out by Dr. van Gent for December 22, 26 and 30. On December 22 the comet was expected to have a right ascension of 22 hours, 51.7 minutes, and a declination of minus 8 degrees, 40 minutes. On December 20 rough visual observations made at Harvard Observatory placed the comet very near that location, at 22 hours, 50 minutes of right ascension, and 10 degrees 30 minutes south of the celestial equator.

In a small telescope it shows a rather bright center and a large hazy head, but no observer has reported seeing a tail. Photographs may be expected, however, to show at least a faint, short tail.

THE PHOTOELECTRIC CELL

THE electric eye, or photoelectric cell, has another job added to its many: it is now used to "see" invisible gases and vapors in manufacturing plants, and warn of dangerous concentrations that might be injurious to workers.

An apparatus, with the electric eye as its key-piece, has been developed by scientists of E. I. du Pont de Nemours and Company and is now in successful use, particularly in detecting the presence of carbon disulfide.

The apparatus, called an ultraviolet photometer, is based on the phenomenon of light absorption by gases. Most gases absorb light of some particular wavelength, in effect casting a shadow where that particular wavelength light should have fallen. In a spectrum the shadow is known as an absorption line.

The instrument, as used as a carbon disulfide analyzer, is so constructed that the air to be analyzed is pumped through several small chambers which filter out dust, oil and moisture, and then into a pair of parallel tubes 31 inches in length. The contaminated air runs into the first tube and then through a canister of activated charcoal which removes the carbon disulfide. The air then passes into the second tube. This makes possible a comparison of the purified with the contaminated air.

Rays of invisible ultraviolet light from a mercury lamp pass through the two tubes and fall upon a photocell mounted at the opposite end of each tube. Carbon disulfide, if present, absorbs light of a particular wavelength.

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SCIENTIFIC INSTITUTIONS AND BUILDINGS OF LENINGRAD

THE scientific institutions and buildings of Leningrad remain in relatively good shape. Soviet scientists are preparing to resume normal scientific life.

The conditions in Leningrad were surveyed by Academician Leon Orbeli, vice-president of the Academy of Sciences of the U.S.S.R. and director of the Pavlov Physiological Institute, in a report prepared by the Soviet Scientists' Anti-Fascist Committee.

The main buildings of the Leningrad Academy remain in good shape, largely due to the work and care of its members who remained there during the war. The old academy buildings and the ethnological museum that formerly housed Peter the First's collection of curiosities are still standing.

Only the botanical gardens suffered heavily. A direct hit demolished the conservatory, destroying rare palms of great value and other tropical plants. Academician Orbeli reports that it is difficult to estimate the damage done to the results of research in the field of botany. The herbarium and world collection of seeds, however, are safe, having been removed to a bomb-proof shelter in good time. The employees of the botanical gardens have begun to restore the gardens and are now growing new seedlings.

Asked how their scientific research work is progressing, Academician Orbeli stated that although the greater part of the scientific workers and their most valuable equipment were evacuated from the city in good time, more than 400 investigators who remained in Leningrad with the Academy and institutions, are continuing their work.

The library of the Leningrad Academy also serves various military and civil organizations.

Work on plants for camouflaging airdromes, cultivation of various medicinal herbs and consultations with truck gardeners are among the war projects of the Botanical Institute, named in honor of Academician V. Komarov. Every foot of available ground in Leningrad was used for truck gardens, so that the average quantity of vegetables per person this winter is higher than that received from outside the city before the war.

In the autumn of 1941, a bomb struck a building of the Pavlov Physiological Institute, but work was continued as every dog used for experimental purposes was saved. Even during the most difficult months of the siege and blockade, Leningrad authorities supplied these animals with sufficient food.

Professor Maria Fetrova, the closest colleague of Ivan Pavlov's, who remained in Leningrad, is conducting experiments on these dogs to determine the influence of bombings and shellings on higher nervous activity. The Koltushi Experimental Station, in which Pavlov spent so much time during the last years of his life, remains the same and continues its scientific work.

The Leningrad Scientists' House, which used to be a club for scientists, with restaurant, library and lounge rooms, has become a center of activities for scientists in the city. Lectures, forums and concerts are held there, with scientific, political and technical experts attending and holding conferences on questions connected with the country's defense. Lectures are often given to Army and civilian audiences.

Looking toward the day when normal scientific life can be resumed in Leningrad, necessary steps are being taken to repair the buildings of the Leningrad Academy and scientific institutions.

ITEMS

A HUGE altitude wind tunnel for research on aircraft engines, the first of its kind, now being built at the Cleveland Airport by the National Advisory Committee for Aeronautics, will see completion the early part of next year. This tunnel, which is part of the $20,000,000 Aircraft Engine Research Laboratory, the largest in the world, will be the first to combine all conditions approaching those of the stratosphere. It will be used to improve the high altitude performance of aircraft engines and engine installations for Army and Navy planes. Giant-bladed fans will create a 500-mile-an-hour wind in the tunnel. Air temperatures in the wind tunnel as low as 67 degrees below zero Fahrenheit, simulating stratosphere conditions at 50,000 feet, will be maintained by the huge refrigeration plant, which will have a capacity twice as large as that of the biggest refrigeration plant in the world. Designed to test engines with a maximum of 3,000 horsepower, it is expected that the tunnel will prove adequate to test engines up to 4,000 horsepower.

LATEST report on the much-discussed question of whether sulfa drugs should be given for the common cold is again disappointingly negative. This time Dr. Russell L. Cecil, Major Norman Plummer, M.C., A.U.S., and Dr. Wilson G. Smillie report, in the *Journal* of the American Medical Association, the results of a careful study of seventy-two colds in sixty-six different persons. Small doses of sulfadiazine were given by mouth daily for four days to forty-eight of these cold victims, while twenty-four served as controls. The treatment did not shorten or alter the course of uncomplicated colds. No striking benefits were seen in the complicated colds. The number of germs, other than the cold virus itself, at the back of the nose above the soft palate decreased uniformly under the treatment and the growth of disease-causing germs, such as pneumococci and hemolytic streptococci, was checked. The cold virus itself is known not to be affected by sulfa drugs. The physicians therefore are opposed to routine use of sulfa drugs for the common cold, but favor their use in a few selected cases as protection against severe secondary infection or complications. Giving sulfadiazine by mouth is simpler and more dependable, they found, than trying to apply a sulfa drug directly to the nose and throat.

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QUANTUM CHEMISTRY

By HENRY EYRING, *Professor of Chemistry, Princeton University;* JOHN E. WALTER, *Instructor in Physics, Princeton University;* and GEORGE E. KIMBALL, *Assistant Professor of Chemistry, Columbia University.*

An introductory treatment which includes discussions of the theory of reaction rates, optical activity, molecular structure, spectroscopy, and group theory. Published in January.

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By EMIL HEUSER, *The Institute of Paper Chemistry.*

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SCIENCE NEWS

Science Service, Washington, D. C.

LONG-RANGE WEATHER FORECASTS

LONG-RANGE weather forecasts, a peacetime dream that seemed unrealizable, have become a working actuality because fighting men, especially winged fighting men, simply had to have them. Pictures of what the weather will be like at the end of two days, 10 days, 30 days are now possible, "with sufficient accuracy to permit of making preparatory plans for future operations," is stated by General H. H. Arnold, in command of the Army Air Forces, in his report to Secretary of War Stimson.

At the beginning of the war, 48-hour forecasts were common enough. But that little time is insufficient margin when plans for a continental-scale invasion of hostile shores are being made. Insistence on working long-range forecasts "at first met considerable opposition both inside and outside the Army Air Forces," General Arnold comments. By pooling all meteorological information of the United Nations, together with some further knowledge captured from German sources, the job was done, and put on a world-wide scale.

Forecasting weather for the Army Air Forces is often as perilous a job as flying through that weather at its worst. The story is told of one group of meteorologists who undertook to set up an observing station on a narrow ledge in an ice-jammed fjord at Prince Christian Sound on the desolate, uninhabited southern coast of Greenland. The buildings have to be tied down to the rocks with cables, to keep from being blown off by the winds of 90- to 175-mile-an-hour that prevail there.

There has been a tremendous increase in Air Weather Service, as in all other branches of the fighting forces. For this particular work, the personnel has been multiplied ninety-fold.

INFLUENZA

THOSE who have been worrying, as most persons have each fall and winter since the war started, over the possibility of a world-wide influenza epidemic as devastating as that of 1918, may be reassured by a statement by the editors of the *New England Journal of Medicine*. It states that any epidemic in the near future is likely to be much less severe than was the pandemic of 1918. This, of course, is only speculation, but is based on significant observations. The observations are:

1. The influenza of the last war had a high mortality, but the deaths were accounted for chiefly by complicating pneumonias in which the hemolytic streptococcus was the germ most frequently encountered. The same was true of the epidemics of measles in Army camps during the last war.

2. During the 1940–1941 epidemic of influenza, the staphylococcus played an important role in complicating pneumonias, but intensive treatment with the sulfa drugs gave quite encouraging results. The results, in fact, were so good that it was suggested that in the event of another influenza epidemic it might be well to use sulfa drugs early in severe cases. This is especially recommended for patients with severe prostration, signs of tracheobronchial and lung involvement and presence of appreciable numbers of hemolytic streptococci and staphylococci in the sputum.

3. Another encouraging omen comes from recent reports concerning measles. Outbreaks of this occurred in the Army during 1943 but, unlike the 1918 experience, deaths were rare. This is attributed to wide-spread use of sulfa drugs in all cases with lung involvement.

"It is not unreasonable," the medical authorities comment, "to expect a similar low fatality rate from influenza occurring under like circumstances."

For the future, there is even more reason for confidence when supplies of penicillin become large enough for large-scale use, since this chemical from mold is especially efficacious in infections with the staphylococcus. This germ is being found in increased frequency in surgical conditions and in complications of other respiratory diseases, so may be expected to play a considerably greater role in future influenza epidemics than in any previous ones.

PURE TUNGSTEN OBTAINED DIRECT FROM ORES

PURE tungsten, much used in war metals, may be produced directly from tungsten ore by a new method successful, at least, in the laboratory. The new process, in which crystalline tungsten is produced electrolytically from a fused borate or phosphate bath, using tungsten ore as the direct source of tungsten, was developed by Dr. Colin G. Fink, of Columbia University, and Chuk Ching Ma, of the Westinghouse Lamp Company, Bloomfield, N. J., and reported by them to the Electrochemical Society.

In the process the tungsten in the ore used does not require preliminary transformation into alkali tungstate as in older processes. The new method may be applied to low-grade ores as well as to high-grade or concentrates ores. The method is technical, but is commercially usable and economical.

Tungsten to-day occupies a major position among strategic minerals. Few metals have so rapidly increased in importance within the past twenty years. It is used as a pure metal, as an alloy constituent in hard steels and other metals, and in chemical compounds. Tungsten is used in high-speed tool steels and in cemented carbides. Tungsten carbide tools, used in thousands of machine shops producing war equipment, have extreme hardness, being surpassed only by boron carbide and diamonds. Tungsten is used for filaments in incandescent electric lamps, as electrodes for hydrogen welding, electric contacts in automobile engines, and has many other uses.

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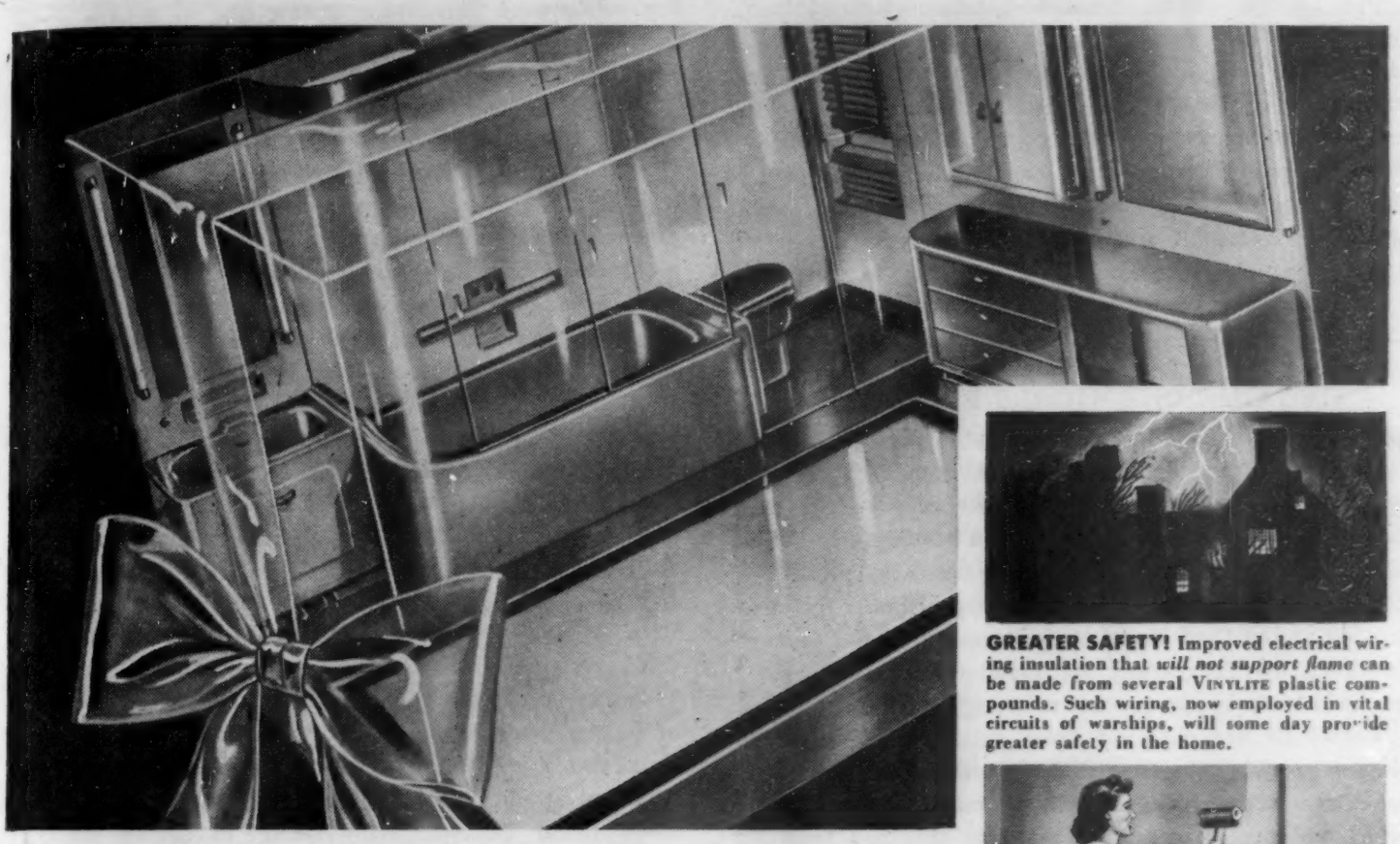

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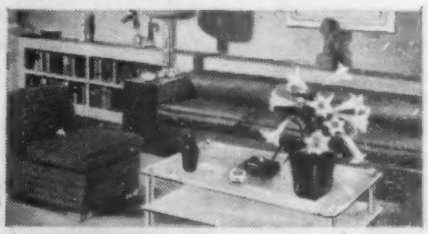

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The United States mines tungsten ores in Arizona, California, New Mexico, Colorado, Idaho, Nevada, Montana, and Washington. Its principal supply has been imported. In 1940, China furnished 46 per cent. of the imports, Bolivia 20 per cent., Argentina 10 per cent., and Australia and Portugal 6 per cent. each. With much of the China ore no longer available steps have been taken to secure increased amounts, particularly from Bolivia and from local reserves. The new process, in which low-grade ores may be used, will undoubtedly increase the use of local minerals.

ORGANIC CHEMICALS FROM COAL

ORGANIC chemicals, now extracted principally from petroleum, will probably be derived more largely from coal in post-war days as the oil reserves become more and more exhausted. The extraction of simple individual chemicals from coal is a difficult process at present because of its highly complex composition. Intensive studies at the Coal Research Laboratory of the Carnegie Institute of Technology in Pittsburgh may result in methods to make the process more simple and economical.

Chemicals are obtained from petroleum by relatively simple processes because the crude oil secured from the earth consists of many individual compounds easily separated and processed. They are now obtained from coal principally as a coke by-product. This by-product is a mixture of aromatic compounds called coal-tar. Coke and gas are the objects of the coking process; the coal-tar is incidental, and normally only about half of it is used to obtain pure chemicals.

As a wartime measure all the coal-tar products are now used, mostly to obtain the essential toluene for TNT, benzene for aviation fuel, and styrene for synthetic rubber. The plastics industry also is a consumer of coal-tar compounds.

Production of coal-tar now is dependent on the amount of coke needed in the trade. The steel industry is the principal user of coke. To increase the output of coke and coal-tar, additional uses of coke must be found either as a fuel, or to furnish pure carbon for many commercial purposes. Coke is principally carbon. Present studies are concerned with how coal-chemicals production can be economically separated from coke production.

ITEMS

Two stars have been found to compose AE Aquarii, a faint star in the constellation of the Water Carrier, where only one was believed to exist before. This star is of the eleventh magnitude and therefore invisible to the naked eye. Examination of photographs of the star by Dr. A. H. Joy, of the Mt. Wilson Observatory, revealed the presence of a close companion revolving around the main star, with a period of less than two days. This is the first time that the binary character of these particular stars has ever been recognized. The photographs also show the presence of bright clouds of hydrogen, helium and calcium gas surrounding one or possibly both of the stars. Seven photographs of the spectrum taken during September and October of this year were studied by Dr. Joy. His work introduces a new line of attack in the study of certain variable stars that in their sudden outbursts of luminosity resemble novae.

COLD winter winds spell doom for potential attackers of stored grain is reported by the U. S. Department of Agriculture. Few insect eggs or other forms of insect life, enemies of the granary, can survive low winter temperatures. And, as grain is an excellent insulator, even the summer heat takes a long time in making its way into the main body of the grain. The autumn chill usually arrives before any harm can be done. To make the most of this natural refrigeration, painting the outer surfaces of granaries and grain tanks white in order to reflect the sunlight and absorb a minimum of heat is recommended. Mild winters in the South make the problem much more difficult in that area. Granary enemies must be attacked in the balmier climates by means of fumigation, oiling or heating.

To assist harried South American farmers who are losing as much as 50 per cent. of their corn crop because of insects, but are unable to obtain fumigants to combat them, a new method of attacking by heat is under investigation by the Institute of Inter-American Affairs at Iowa State College. Now being developed by Paul Douglas, associate engineer of the food supply division of the institute, the solution to this problem calls for the construction of a brick storage building, fourteen feet high and six feet wide, in which can be stored 160 bushels of shelled corn, the harvest from about ten acres. Through the center of this building, a wood furnace and flue are built to furnish the temperature of 120 degrees Fahrenheit which is needed to kill the pests. Detailed plans for the structure, method of operation, handling of the corn at harvest, preliminary drying for storage and determination of moisture content are expected by Mr. Douglas to be available for the South American farmers upon completion of the present research project.

RATS are saboteurs of the most destructive sort, it appears from figures compiled by biologists of the U. S. Fish and Wildlife Service. The damage they caused last year is estimated at more than $200,000,000. Rat damage went up during 1943 not so much because there were more rats as because the cost of commodities in general had increased. Higher cost of living means higher cost of keeping rats on the premises. Men experienced in rat control estimate the over-all rat population of American farms at around 60,000,000. The farm is the rat's great stronghold with plenty of hideouts and plenty of food he can steal. Cities harbor fewer of the vermin: improved ratproof construction, better clean-up of garbage and the vanishing of the city horse are cited as factors in the rats' back-to-the-farm movement. In addition to their role of thieves, rats are incendiaries. They steal matches, gnaw wire insulation, cause leakage of chemicals. Worse still, these vermin harbor smaller vermin (fleas) which in turn are carriers of two much-feared diseases: the American form of typhus fever and bubonic plague.

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SCIENCE NEWS

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THE TOTAL ECLIPSE OF THE SUN

THE total eclipse of the sun on Tuesday, January 25, will be best observed in South America and Africa, but spectators in southwestern United States can see a portion of the sun covered by the shadow of the moon.

The farther south spectators from Florida to Texas are, the greater the portion of the sun that will be hidden from them, because of their nearness to the path of totality.

The shadow of the moon will touch earth in the Pacific Ocean near the equator, directly south of lower California, at sunrise. Reaching South America, it will cross the town of Chiclayo on the coast of Peru, go across inland Brazil and finally reach the Atlantic Coast at Fortaleza.

Speeding over the ocean to Africa, the moon's shadow will leave the earth as the sun sets for people in French West Africa. About four hours 20 minutes will be required for the shadow to make its journey.

In its path, a hundred miles or so in width, the moon will completely blot out the sun. In interior Brazil, where the eclipse will last longest, the sun will be covered for four minutes nine seconds, which is unusually long, though considerably short of the seven-and-a-half minutes which an eclipse theoretically can last.

The period of totality in Peru is about a minute less than in Brazil and the sun will be 30 degrees or so lower in the sky. But there is little rain in this desert region and the chances of really seeing the eclipse are much better.

Often the favorable locations from which such total solar eclipses can be seen are almost crowded with astronomers, but this year, due to the war, the eclipse will be poorly observed. So far as is known, only one or two expeditions from Latin America will study the eclipse. The Mexican expedition will observe the spectacular fade-out of the sun from Peru, where the chances of clear skies are much better than in Brazil.

GAS-TURBINE LOCOMOTIVES AND SHIP ENGINES

GAS turbines for locomotives and ships are post-war probabilities, although just at present relatively little development work is in progress because immediate war needs have the right of way.

Economy in performance is one of the advantages claimed for this type of power unit. American and English engineers are investigating its possibilities. Reports from both countries have been issued recently.

Stationary engines of the gas-turbine type have been in successful use a decade or more. They are reported economical in fuel consumption and in lubrication. Being purely rotating machinery, they require but a small amount of lubricants in proportion to the fuel requirements. In steam locomotives lubrication costs may amount to 10 per cent. of the fuel costs.

If found adaptable for locomotives and ships, the gas-turbine engine has another important advantage: it uses no water. Modern American steam locomotives carry often as much as 100 tons of water. An engine that operates without the use of water means not only a saving in the weight carried but also a great saving in the otherwise necessary costs of procuring, delivery, purifying and softening the water. This is considerable in arid regions.

The operation of the gas turbine is similar to that of the steam turbine, but instead of burning fuel oil to generate steam, the oil is burned at nozzles, making a greatly expanded gas which passes directly through the hundreds of vanes on the turbine, imparting to the shaft a rapid and powerful rotation. The principle has been known for many years, but its application had to await the development of alloy metals that would stand up under white-heat temperatures. Such metals are now available.

A new report to the American Society of Mechanical Engineers by a committee on gas-turbine-powered locomotives indicates the possibility of constructing a high-powered locomotive in one unit with the prime mover and all accessories in one cab on two trucks having all the axles and wheels of both trucks power-driven. This would combine great power with light weight. A leading English technical journal, reviewing gas-turbine locomotive development, is of the opinion that this type of power will be used, especially in countries where fuel oil is available. As yet, coal can not be used for the gas turbine, but later coal may be converted to fuel oil more economically than at present making the gas turbine locomotive possible to replace coal-burning steam types. A report, made at the 1943 fall meeting of the American Society of Naval Architects and Marine Engineers, indicates that this type of engine is expected to be as suitable for continuous-duty marine service as the steam engine.

IRON AND STEEL PLANTS IN THE DONETZ BASIN

RETREATING under blows of the Soviet troops, the German armies are destroying everything in their way and have caused great damage to the iron and steel plants of the Donetz Basin. The Russians are working strenuously to restore what the Germans have destroyed. Their work is described by Ivan Frantsevitch, associate member of the Ukrainian Academy of Sciences, in a report prepared by the Soviet Scientists' Anti-Fascist Committee.

Despite wartime difficulties, outstanding specialists of the Iron and Steel Institute of the Ukrainian Academy of Sciences and all other scientists working in metallurgy have pooled their efforts and are working out practical and theoretical problems of the industry.

Academician Maxim Lugovtsev, director of the Iron and Steel Institute, is working on a thermo-dynamic theory of blast furnace processes. Problems connected with the development of new iron and steel industrial sites of the Kazakh Soviet Socialist Republic of the Urals and distant Siberian regions are being studied under his guidance. Academician Dobrokhotov and his associates

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APPLICATIONS OF ELECTROCHEMISTRY

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Volume II of "Principles and Applications of Electrochemistry" (Volume I on Principles is by H. Jermain Creighton). A thoroughly revised edition, with up-to-date material added on many subjects including new data on certain types of storage battery, on chlorine caustic cells, on magnesium from sea water, on new types of furnace, on electroplating and other important matters. Published in January.

Second Edition: 573 pages; 5½ by 8⅜; $5.00

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succeeded in improving the production of special chromium alloys, such as chromium manganese and nickel chromium steels. Pavel Emelyanenko, associate member of the Ukrainian Academy of Sciences, has worked out new methods of tube rolling; for this he was awarded the Stalin Prize and decorated with the Order of the Red Banner of Labor. Academician Georgi Kurdyumov is completing his research work of many years on the phenomena of heat treatment of steel.

Specialists in rolling submitted a reconstruction plan for the tube industry and details such as type and location of plants to be restored are now being worked out.

Restoration of factory laboratories will require a great deal of work. Many Ukrainian iron and steel plants had excellent laboratories, several of which could rival research institutions. One of these was the laboratory of the Makeyevka plant which was equipped with delicate devices for testing the structure of metals. All these laboratories were destroyed by the Germans.

Now workers have been organized to aid in rebuilding the laboratories and a special organization is being created in the Ukraine for restoring up-to-date factory methods. A group of scientists, including Academician Lugovtsev, is preparing to leave for the Donetz Basin to help to organize the work of reconstruction.

THE SCIENTIFIC ADVANCEMENT OF MEXICO

MEXICO was once the most scientifically advanced country in the western hemisphere. Alexander von Humboldt, the famous German naturalist, explorer and historian who visited there at the beginning of the nineteenth century, set Mexico at the head of all Western Hemisphere nations in cultural attainment at that time.

Humboldt's travels between 1799 and 1804 and study of sciences in Latin-American countries were described by Dr. C. A. Browne, of the U. S. Department of Agriculture, speaking in New York before a meeting of the History of Science Society.

From Mexico, the great traveler pointed out, came the invention of the process of amalgamation of metals, about 1551. Humboldt cited, also, the excellence of the Mexican School of Mines under the direction of Andres del Rio, discoverer of vanadium in 1801.

This historian of Latin America emphasized that the principal source of Mexico's riches was not her gold and silver mines, but her agriculture. Humboldt studied the historical origin, geographical distribution according to soil and climate, industrial use and economic importance of some twenty-five Mexican plant and animal products.

On his scientific journeys, Dr. Browne stated, Humboldt gathered material on the food habits, dress, language, folklore and primitive arts of the various Indian tribes in the Latin-American countries. He studied at first hand the manufacture by the Indians of the deadly poison, curare, as well as silver smelting, which reached its highest development among the Peruvians.

ITEMS

DRS. H. B. HASS and A. L. Barney, of Purdue University, Lafayette, Indiana, recently reported to the American Chemical Society that they have developed a new method of producing menthol artificially. Synthetic menthol which resembles natural menthol in its chemical structure can be produced commercially from thymol. The synthetic menthol has the same taste and odor as natural menthol, and pharmaceutical differences, if any, are slight. The new process is one of distillation, beginning with thymol hydrogenated to a complex mixture of alcohols and ketones. Menthone is produced first, and this is then reduced to synthetic menthol. Thymol is found in oil of thyme, of which there is no particular shortage at the present time. Natural menthol is found mainly in the Orient.

CITIES which have increased greatly in size due to war activities can probably settle down to a more normal existence after the war, as these increases appear unlikely to be permanent. War workers are generally pessimistic about their chances of holding their jobs after the war, according to Jerome S. Bruner, associate director of Princeton University's Office of Public Opinion Research. He reports in a recent issue of the *American Journal of Sociology* that the highest percentage of readiness for migration is in shipbuilding cities, next highest in aircraft towns and the least in steel and automotive centers. Thus Detroit, San Francisco, Oakland, Los Angeles, Washington, Norfolk and other cities which have undergone an increase of from 100,000 to nearly 400,000 since the war may lose a large percentage of this migrant population after peace is declared.

"MECHANICAL functioning of the aircraft engine can be reasonably well established on the test stand, but installation and flight factors affecting its operation in the air have to be determined in the plane itself," was reported by L. C. Miller, of the Wright Aeronautical Corporation, Paterson, N. J., at the meeting of Automotive Engineers. Experimental flight testing at the plant of the manufacturer is advisable. An engine in a plane is subjected to accelerations in three dimensions of space and in many different attitudes with relation to the force of gravity, he explained. "It is difficult, if not impossible, to simulate altitude temperature and pressure variations on the stand and to evaluate these factors on engine performance."

A NEW, highly versatile plastic, named polythene, has been developed by Du Pont chemists and is now ready for the market in commercial quantities—provided necessary allocations for war purposes can be shown by the processor. It is stated to possess physical qualities that will make it useful in such peacetime employments as toothpaste tubes, wire insulation, waterproof coatings, piping and adhesives. In thin sheets it is flexible without being limp and rubbery, while in thicker shapes it is still enough to be classified as a rigid plastic. Polythene is made by the polymerization, or chemical welding, of large numbers of ethylene molecules. Ethylene is a gas derived from petroleum, natural gas and coal, hence is a cheap, easily obtainable raw material.

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In this text the student is encouraged to obtain a sound practical knowledge of the essentials of each organ system with a minimum of help from the instructor. Several sections have been considerably enlarged and more emphasis placed on comparative studies. A useful section on preparation of material has been added. Nearly every structure mentioned in the text has been shown in some figure. Revised by F. A. STROMSTEN, D.SC., State University of Iowa. **174 Illus., 328 Pages. $3.00** (1937)

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SCIENCE NEWS

Science Service, Washington, D. C.

DISCOVERY OF THE FAINTEST STAR

THE discovery of a star of such extremely low luminosity that a million stars like it would be needed to equal the sun's brilliance has been anounced from the McDonald Observatory of the Universities of Chicago and Texas.

This important contribution to astronomical observations follows closely the discovery at the same observatory of an atmosphere of methane around Saturn's largest satellite.

The present discovery was made by Dr. G. Van Biesbroeck, of the Yerkes Observatory, when comparing two plates taken at the prime focus of the 82-inch McDonald Observatory reflecting telescope. On these plates the star known as "BD plus 4 degrees 4048" is found to have a companion star at a distance of 74 seconds of arc away.

The companion is identified by the fact that it shares the apparent motion of the brighter star across the sky; the companion itself is of the 18th magnitude as seen on the plate.

In order to determine the intrinsic brightness of this star, however, its distance from us must be known; this is of course practically the same as that of the primary star. This star happens to be rather close to the sun as astronomical distances go, its distance being about six parsecs, or 19½ light years. In other words, light traveling at some 186,000 miles per second requires nearly 20 years to reach us from that star.

However, the nearest star is no nearer to the sun than one-fifth of this distance. The faint companion star's intrinsic luminosity comes out very faint; it is expressed by astronomers as being of absolute magnitude 19 on red plates. This makes it three magnitudes or about 15 times fainter than the faintest star previously observed, Wolf 359, which has a red absolute magnitude of 16.

Wolf 359 is only eight light-years away, so its earlier discovery is not surprising. The sun is on the order of a million times as bright as the new faint star.

In making his announcement, Dr. Van Biesbroeck calls attention to the fact that if this star and Jupiter were placed at the same distance Jupiter at its brightest would still be seven magnitudes fainter than the companion of the star known as "BD plus 4 degrees 4048." This is a factor of about 600 times and makes it fairly certain that the faint star is shining by its own light rather than reflecting light from its primary; whereas Jupiter shines only by reflected sunlight.

Jupiter is the largest planet in the solar system, so it is also one of the brightest, even though it is five times as far from the sun as the earth is. The new faint companion star, however, is some 440 times the earth-sun distance from its principal star which makes it quite certain that its light is not reflected. At present nothing can be said about the mass of this newly found faint star but it must evidently be rather small unless it is some unusual sort of highly condensed star. Ordinarily the mass of a star is closely related to its luminosity.

The importance of this problem is its relation to that of the recently discovered stars of very small mass such as the invisible companion of 61 Cygni. This latter star discovered by Dr. K. Aa. Strand of Swarthmore has a mass only 16 times that of Jupiter, but Dr. Strand's observations reveal nothing of its brightness. The small star is invisible, and is detected by its gravitational effect on the primary star around which it revolves.

Is Van Biesbroeck's new star of as small mass as Dr. Strand's? If that question can be answered considerable light will be thrown upon whether to call such small and faint objects stars or planets. Astronomers are at present undecided which term ought to apply, but discoveries such as Dr. Van Biesbroeck's are rapidly clearing up the matter. It is possible that the distinction between planet and star may some day almost cease to be plausible.

Included in the information supplied to the Harvard clearing house by Dr. Van Biesbroeck for distribution to American and foreign astronomers is that the position angle of the faint star is 150 degrees; that the common proper motion is 1.45 seconds toward 204 degrees; that the parallax is 0.17 seconds and the projected separation is 440 astronomical units.

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B VITAMINS

AT least two vitamins of the B complex group, riboflavin and the pellagra-preventive niacin, appear to be factors necessary for the production and regeneration of the blood in the animal body, according to reports to the *Journal of Biological Chemistry*.

A stunting of the red blood cells that are constantly being produced by the blood-forming organs, and a consequent mild anemia, result from a synthetic diet containing all the known essential nutrients except riboflavin, was found by Dr. C. A. Elvehjem and his associates of the University of Wisconsin. This anemia, produced in dogs, is a direct result of the riboflavin deficiency and readily responds to a corrected diet containing adequate amounts of riboflavin. Riboflavin is indispensable for normal growth and development. The results of these experiments therefore "suggest that in growing dogs there is a competitive need for riboflavin for growth and hemoglobin production."

It has also been suspected for some time that anemia, at least as found in pellagrins, is in some way associated with niacin deficiency. Dr. Philip Handler and Dr. William P. Featherston, of the School of Medicine of Duke University, show, apparently for the first time, that the anemia in pellagrous dogs is specifically due to this deficiency and can be corrected only by the administration of adequate amounts of this vitamin. The red blood cells in this anemia are large but below normal in number and hemoglobin content.

The dietary and other factors that are known to be involved or helpful in the production of blood cells in the body, such as iron, protein, glucose, hemoglobin, the anti-pernicious anemia factor of liver extract, xanthopterin and excessive amounts of cobalt were without effect when administered to the pellagrous and anemic animals. They were successfully treated, however, with niacin.

Mature red blood corpuscles are not true cells since they do not have nuclei. In the early formative stages, however, they do have nuclei. It is the theory of the authors that niacin is necessary for the proper production and maturation of these blood cells. This vitamin is known to play an important rôle in the respiration of all cells of the body. The lifetime of blood cells appears to be very short and the rate of turnover is quite rapid. Consequently the requirements of niacin for the manufacture of blood cells might be correspondingly great. A niacin deficiency, besides producing the usual symptoms of pellagra, might also lead to anemia because of the inadequate supply of this vitamin for development of the red blood cells in the early stages.

ITEMS

THE appearance of a small sunspot on Saturday, January 22, marks the end of the longest period without a sunspot of appreciable size since the early 1930's. The sun's surface has been unmarred by any identified spots since December 25. A few faint markings were discovered on plates made at the Mount Wilson Observatory the middle of last week, but were not found on plates made at the U. S. Naval Observatory. Thus 28 days have elapsed since the last sizable sunspot was visible.

GREAT strides have been made during this war in the progress of welding from an art to a science, according to W. P. Eddy, Jr., of the General Motors Corporation, who spoke at the meeting of the Society of Automotive Engineers. Two of the outstanding advances are spot-welding and arc-welding of armor and other highly stressed parts of carbon and alloy steels previously considered unweldable, at least for primary structures. New automatic arc-welding equipment has been devised to weld carbon and alloy steels with high degree of uniformity and at far faster rates than obtainable by manual welding. In both automatic and manual arc-welding of hardenable steels, use of austenitic welding rod was first developed. Steel in these electrodes contained a total of 30 per cent. or more of alloying nickel, chromium, manganese, molybdenum or other metals. Recent work resulted in the development, for automatic welding, of a low-alloy steel electrode containing only a tenth of the total alloy content formerly considered necessary. A low-alloy rod for manual welding has still more recently been developed. Mr. Eddy discussed the effects of other wartime developments pertaining to steel on future steels. The more important of them, he said, have been made in fatigue endurance, heat treatment, castings, alloy evaluation, hardenability and special addition agent steels sometimes called needled steels. These needled steels are made, usually in open hearth furnaces, by normal practices, with a minute percentage of one of the special agents added. These agents are of various composition but all contain boron.

NEW war standard specifications for radio dry electrolytic capacitators of the home receiver replacement type, and for dimensions for radio-frequency thermocouple converters, have been announced by the American Standards Association. The dry electrolytic capacitators chosen represent the least number of units necessary at this time for servicing the great majority of home radio receivers. The minimum performance requirements are designed to furnish capacitators which will use as small an amount of strategic materials as possible, will not restrict production, and will prove satisfactory from an electrical and service standpoint. Thermocouple converters covered by the new standards are being manufactured widely in the trade. It is expected that the standards will be used by the armed forces in the design of new equipment and for replacement parts wherever possible. It is estimated they cover 90 per cent. of the thermocouple converters now used in radio and electronic equipment. The converters will be interchangeable for use with radio-frequency currents from 120 milliamperes to 10 amperes inclusive.

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SCIENCE NEWS

Science Service, Washington, D. C.

SX CASSIOPEIAE

A STAR that appears to be "playing catch" with itself, tossing a part of its own flaming atmosphere far out into space, clear around its companion in a double-star team and recovering part of it on its return trip, is described by Dr. Otto Struve, of the Yerkes Observatory, in *The Astrophysical Journal.*

The star is a rather faint double one, designated by astronomers as SX Cassiopeiae. Cassiopeia is the constellation landmarked by the great W-shaped group of stars on the opposite side of the Pole Star from the Great Dipper.

As Dr. Struve pictures the phenomeon, a stream of gas issues from one member of the double-star team and divides on the far side of the second member. Part of the stream flows off into space, while part circles around the second star and returns to rejoin the atmosphere of its parent star. Some tenuous, absorbing cloud of gases acting in this manner would explain the peculiar variations observed in the case of SX Cassiopeiae.

A powerful stream of cool but rapidly moving gas flows out from the G star toward its companion. One part of the stream, presumably composed of the more distant or more rapid strata, expends outward and leaves the system. The other part flows around the A star, and having become hotter, but traveling more slowly, ultimately returns to the G-type star. It is not possible to see this streaming action, but spectroscopic studies make this the most plausible picture.

The stream of ionized metals such as calcium and iron flows at a height above the surface of the A star about equal to the star's diameter. According to Dr. Struve, "The most interesting feature of SX Cassiopeiae is the observation of an approaching shell at and near secondary eclipse. These motions are plausibly attributed to the turning over of the stream due to conservation of angular motion. Only a part of the stream is retained by the system and completes the entire circuit around the A star."

The spectrum of this eclipsing double star is a blend of a true star of the G type, to which class the sun belongs, and lines of another origin which resemble the shell lines of an A star, a type which has much hydrogen in its make-up. The giant G-type star, which ejects the stream of gas, is believed to be larger than the luminous A-type star. The relative masses of the two, however, have not as yet been determined. The A star is completely eclipsed once every 36.567 days, giving a chance to to study the G star directly. But the streams of gas from the G star are projected upon the disk of the bright A star, so that a clear view of it is never realized for study.

That SX Cassiopeiae is not just a simple system of two eclipsing stars was discovered by Mme. L. Ceraski at Moscow in 1907. Peculiar variations in the star's velocity curve were observed by A. H. Joy at the Mount Wilson Observatory. These, Dr. Struve believes, are probably due to changes in the density of the gas within the streams. "The entire picture is very similar to that observed in Beta Lyrae," he states, "only here the smaller, and probably less massive star, is the bright A-type component."

THE POST-WAR STEEL INDUSTRY

IN a report to the American Chemical Society, Dr. John M. Weiss, New York industrial chemist, expresses the opinion that aluminum and magnesium will not seriously menace the steel industry after the war, neither will plastics. Nor will the use of plastics be a hindrance to light-metal developments.

The yearly capacity of the steel industry is approximately 100,000,000 tons, the estimated capacity figures for aluminum and magnesium are 1,500,000 tons and 300,000 tons respectively, he states. The production capacity of the light metals is less than 2 per cent. of the steel production. "Competition and new needs may so stimulate the alloy steels as actually to increase production," he said, "and thereby bulwark the steel manufacturers."

The present large uses of aluminum and magnesium are in airplane construction and in incendiary bombs. The latter will disappear with peace and the former will undoubtedly be sharply reduced. New uses for aluminum and magnesium reaching far beyond the transportation field will be necessary if the plants are to continue to operate at capacity. It is estimated that synthetic plastics capacity represents only about 15 per cent. of the projected light-metal capacity.

Dr. Weiss concludes that "Many uses of plastics, notably the protective coating field, are not competitive with the light metals. Likewise, the transparent and colored specialty products do not fall into the competitive class, so that the impact on metal is even less than the tonnage figures indicate."

MONTHLY CLIMATIC MAPS

A GLANCE at the series of new monthly climatic maps of the world prepared by the Army Map Service shows what kind of weather may be expected, on the average, each month in the year over all six of the world's continents. Each kind of climate is shown by a distinctive color, so all you need to do is find a matching color on the map of North America or other familiar region, and plan accordingly. Thus, Timbuctu in June is colored up like western Texas in July. You'll find the same color around Darwin, in northern Australia, right now—it's still high summer in the southern hemisphere.

By matching colors on these new maps, the supply officer will learn that Tokyo weather is virtually identical with that of Washington, D. C.; that the terrific Russian winters are about like normal winters in northern Minnesota, North Dakota or Maine; that the city of Duluth is climatically about on a par with Leningrad; and that Bismarck, N. D., has a climate similar to that of Moscow.

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3) *It points out some of the economic aspects of biology aside from those affecting personal health.* More than the usual amount of space is devoted to the discussion of the sources of man's food supply, clothing, shelter, drugs, and the like. These matters are treated from a world viewpoint, rather than from a purely local or national one.

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the rainfall, temperature and humidity, the maps are an invaluable aid in the determination of types of clothing and equipment for our fighting forces stationed at distant and heretofore relatively unknown and uncharted regions.

Looking into the future, Major W. F. Heald, of the Climatological Unit of the Quartermaster Corps, predicts a very practical peacetime use of these maps when pleasure travel is again in order. A glance at the current map, and no guesswork at all will be necessary for planning what to pack into a suitcase on any trip, no matter where you are going.

ARTIFICIAL SUNLIGHT AND JAUNDICE

A "PILOT experiment" suggesting that artificial sunlight may be the weapon for fighting the danger of jaundice in persons who get human blood serum for transfusions or protective inoculations is reported by Dr. John W. Oliphant, Dr. Alexander G. Gilliam and Dr. Carl L. Larson, of the National Institute of Health.

The problem has caused national concern when more than 28,000 soldiers developed jaundice following inoculations against yellow fever. The Army solved its problem by switching to another type of anti-yellow fever vaccine which does not contain human blood serum. So far as known this new vaccine has not produced jaundice. Jaundice, perhaps of the same type, was the major disease with which the Nazis have had to deal on the Eastern front, according to German medical reports that have reached this country.

Even though our fighting men are not now in danger of jaundice from vaccinations protecting them against yellow fever, cases of the same ailment have been reported among civilians who were given convalescent serum for measles and mumps and following blood transfusions.

If the findings of the Public Health Service pilot experiment are confirmed by further tests, the danger of jaundice following transfusions might be averted by passing the blood or serum for the big transfusion banks in a thin stream through artificial sunlight. For smaller quantities of human serum, used to prepare vaccines against disease, advantage might be taken of the fact that about two and a half months after a person has had this jaundice, the disease-producing agent disappears from his blood.

The cause of the disease is believed to be a virus, but so far scientists have been unable to identify it, or to give the disease to laboratory animals. For the Public Health Service studies, 189 persons volunteered to get the disease so that their blood could be used to learn more about it. Most of them had only mild attacks and all recovered.

This serum jaundice is apparently not caught by contact with patients, although acute infectious jaundice is. Some believe that they are different diseases with different, unknown germ or virus causes. Others think that they are the same and that the differences are due to the difference in getting the disease through serum inoculation or through contact with infected droplets on the patient's breath.

ITEMS

THE discovery that a star, which greatly increased in brightness a number of years ago because of an internal explosion, has become egg-shaped may bring us closer to the secret of the origin of our solar system. A cable received at the Harvard College Observatory from Dr. J. S. Paraskevopoulos, superintendent of the Southern Astronomical Station of the observatory, states that the old nova in the southern constellation of Pictor, the Painter's Easel, is decidedly elongated. This nova brightened to a magnitude of 1.2 in 1925. Photographs made with the 60-inch Rockefeller reflector at Bloemfontein, South Africa, fail to show the usual haze which normally surrounds many of the novae. Revolutionary phenomena similar to those observed for the famous Nova Herculis of 1934 and Nova Persei of 1901 have apparently taken place within Nova Pictoris. These explosive phenomena may be linked with the evolution of planetary nebulae, but there is as yet no good evidence that they are connected with the evolution of planetary systems.

APPARENT support for an old folk-belief that onions, garlic and their strong-scented kin-vegetables are "good for what ails you" is offered by the reported discovery, by Professor B. P. Tokin, of the University of Tomsk, USSR, that their essential oils contain substances that kill bacteria, protozoa, and even larger organisms like yeast cells and the eggs of certain lower animals. The report is contained in a bulletin of the USSR Society for Cultural Relations with Foreign Countries. Professor Tokin has given the name "phytoncides" to the substances he has isolated. Experimental use in hospitals is now being made of these compounds, particularly in the treatment of suppurative wounds.

WATER can be used to conserve oil by means of a newly developed procedure described by W. L. Horner and D. R. Snow, of the Barnsdall Oil Company, at the Chicago meeting of the American Petroleum Institute. By injecting water into underground oil reservoirs as withdrawals are made, the original oil pressure is kept up to par. Both newly discovered and partly depleted oil pools may use this method of maintaining underground pressure, providing that reservoir conditions are such that artificial water drive can be applied. Water injection has been used only on wells that are growing old; the method has hither not been considered suitable for pools in early stages of production.

IF you want to know whether your favorite tooth powder or paste is wearing out your teeth, the National Bureau of Standards has a scientific test. The bureau now has developed a method to measure accurately the abrasive effects of tooth-cleaning preparations, and also the wearing effects on the teeth, if any, of various solutions used as mouth washes. In measuring tooth-wear from abrasion or solution, the bureau uses an "indenter" of diamond hardness developed in its laboratories a few years ago. An extracted tooth is first polished and then scratched with it, making an indentation of known size. It is then polished mechanically with the dentifrice, or dissolved in a solution. The degree of disappearance of the marks indicates the hardness of the tooth, or the wearing effect of the polishing material or of the solution.

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By HAROLD S. DIEHL, M.D. 315 pages, 6 x 9. $1.75

In this condensation of *Textbook of Healthful Living* the author answers the urgent need for a brief, vital text suited to the shorter courses in hygiene necessitated by wartime conditions. All material and data have been revised in the light of the latest information, and much of the subject matter has been rewritten in more compact form. In view of the special health requirements created by the war, the sections on physical fitness have been revised and expanded. A new section on heredity has also been included.

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SCIENCE NEWS

Science Service, Washington, D. C.

THE WORLD'S LOW TEMPERATURE RECORD

IN an address before the Pennsylvania State College chapter of the Society of the Sigma Xi, the first of a series of such addresses throughout the nation, Professor Peter Debye, professor and chairman of the department of chemistry at Cornell University, stated that although the world's low temperature record is now within a thousandth of a degree of the unattainable absolute cold, there is a good hope that it will be pushed still farther downward.

This will be done by "attacking the disorder hidden in the nucleus of the atom" by use of the magnetic properties of the inner core of the atom instead of the cloud of electrons about it. The influence of a magnetic field upon the spinning electrons made possible the drop in temperature from about a degree to a mere fraction of a degree.

Cooling is explained as an approach to "a state of highest possible order" and at a degree above absolute zero the disorder connected with the motions of the atoms and molecules has been largely removed. The next step is to bring order within the nucleus of the atom in order to get to an even lower temperature.

The phenomenon of paramagnetism will be used in these experiments, not yet performed, just as it was used in pushing the temperature to its present low level. When a paramagnetic substance, like a piece of soft iron, is demagnetized by taking the magnetic field away from it, it absorbs heat.

This method of getting temperatures lower than are attainable by liquefaction of helium gas was proposed sixteen years ago by Professor Debye, then in Berlin, and independently by Dr. William F. Giauque, of the University of California, and was applied a decade ago in several laboratories here and abroad.

In measuring temperatures just above absolute zero the low temperature gas pressure thermometers used at slightly higher ranges can not be used, but a satisfactory temperature scale can be based on magnetic measurements alone.

Absolute zero is minus 273.1 degrees Centigrade. Helium, the gas that is hardest to liquefy because its molecules have the smallest mutual attraction, boils at 4.2 degrees above absolute zero and by dropping the pressure to 1/200,000th of an atmosphere, a temperature of seven-tenths of a degree above absolute zero can be obtained. For lower temperatures, the magnetic method must be used.

HELICOPTERS

HELICOPTERS are ideal craft for many of the Coast Guard's regular peacetime tasks, is stated by Lieutenant Commander F. A. Erickson, in an article in the *U. S. Coast Guard Magazine*. The uncanny ability of these whirligig flying-machines to slow down and "stand still" in the air, and to climb and descend at very steep angles to blanket-sized landing spots, enables them to carry out such typical Coast Guard missions as close-up inspection of suspicious-looking boats off shore, putting pilots aboard incoming vessels and removing them from out-bound ones, removing crews from stranded or foundering ships and from ice floes and other situations of peril, carrying lines aboard them from surface rescue vessels, and transferring supplies and personnel to and from lighthouses, light-ships and other isolated navigational aids.

As evidence of the helicopter's extreme maneuverability, Commander Erickson lists the series of "impossible" stunts through which a heliocopter pilot student is required to put his machine at twenty-five hours of flight training. A few of them are: Take off sidewise and climb at a 45-degree angle. Come down the same way, but stop and hover awhile before setting the ship down; take off backward and fly tail-first. At 25 or 50 feet altitude, while continuing flight in same direction, swing tail around and go on nose-first; from 200 feet altitude, make 60-degree glide and land on marked area approximately 20 feet on a side; fly around the boundary of a square, stopping in the air at each corner, without deviating more than one foot, either vertically or horizontally, from true flight line.

FARM MACHINERY

RUST-RESISTANT tillage tools, power-operated orchard-pruning shears and saws, tractors with chassis for mounting various harvesting machines, are a few of the new form implements that should be developed for post-war use, according to Professor E. G. McKibben of the Michigan State College in a report made to the American Society of Agricultural Engineers.

Farm tillage tools and machines are constantly surrounded by ideal rusting conditions and farmers are notably careless in protecting them. Professor McKibben suggested that corrosion-resistant metals developed in recent years by metallurgists should replace those now used. "If we really wish to keep tillage elements from rusting it may be easier to change the character of the tillage tool than that of the farmer."

"In round figures there are well over 3,000,000 acres of orchards, groves and vineyards in the United States," he pointed out. "Three million acres of pruning represents a lot of strong-arm work." Power-operated pruning shears and saws appear to Professor McKibben to be a reasonable suggestion to eliminate some of this hand pruning. "Field machines which would operate in their own paths and turn in their own lengths would solve most of the machine problems resulting from small, irregular fields and such soil conservation practices as contour farming and strip cropping." Machines that will operate both in their own paths and to the side are needed for grass-cutting in orchards and use in other places.

The present draft tractor perhaps should be replaced by a tractor which would be primarily a chassis for mounting such machines as balers, forage harvesters, combines for harvesting small grains, and corn harvesters.

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Many of these present self-propelled machines are in use only a relatively small number of days in a year. Reliable light gasoline engines, equipment to give better weed control, precision planters for sugar-beet and other crops, conveying and elevating equipment, potato harvesters that will separate the potatoes from stones and clods, and "once-a-season lubrication" for important farm machines—all of these are among other new farm machine developments needed.

BOLIVIAN TIN

BOLIVIA'S tin is a number one war essential to the United States and the United Nations generally. The overturn of the Bolivian government should not decrease the supply of tin ore, since Bolivia recently declared war on Germany, but directly or indirectly it may.

Bolivia is primarily a mining country. In pre-war days it produced about one-sixth of the annual world's supply of tin ore. It produced many other metals; but tin became the all-important metal after sources in British Malaya, the East Netherlands, Thailand, China and other places in the Far East were cut off by the Japs. The large tin smelter constructed as a war measure in Texas by the United States government uses Bolivian ore. Bolivia has no smelters of its own.

Bolivia, located at high elevation on the Andean plateau, has no seaport. Between it and the Pacific Ocean lie Peru and Chile. On its north and east is Brazil, on its southeast and south are Paraguay and Argentina. Some of its drainage is into the Paraguay River (called Parana south of the Paraguayan border) but most of it is by tributaries of the Amazon.

The principal railroad of Bolivia connects its capital, La Paz, which is near the Peruvian boundary, with Arica on the coast of Chile. The road, from 250 to 300 miles in length, runs southwesterly from La Paz without touching Peru. About one third of its mileage is in Chilean territory. Nearly 100 miles of Chile separates Bolivia from the Pacific.

In size Bolivia is nearly as large as Arkansas, Louisiana, Oklahoma and Texas combined. It contains 416,000 square miles, less than 60 per cent. of its area in 1900. Its population in 1940 was approximately 3,500,000, three fourths of which was Indian or mixed bloods.

Bolivia and Paraguay are the only South American countries without seacoasts. Paraguay has river transportation down the Parana to the La Plata and the South Atlantic. Bolivia's desire for a little of northern Chile, or a little of southern Peru, has been the cause of interior trouble in the past and is reported to be one of the factors in the present situation. Wages for miners is another source of dissatisfaction and caused conflicts in 1942 between the miners and the government resulting in bloodshed.

One result of this conflict was an investigation by a special United States commission, as interruption to mining would make impossible the delivery of tin and tungsten ore for which the United States had previously entered into contract with Bolivia. Under this contract the United States agreed to buy 18,000 tons of tin annually for five years, and 3,000 tons of tungsten for three years. In July, 1942, the American government agreed to increase the amount of both tin and tungsten to be purchased. Also it loaned Bolivia $25,000,000 for the construction of four major highways, the establishment of a national sugar industry, the stimulation of petroleum production, and other economic purposes.

Tin ore constitutes over 75 per cent. of Bolivia's export trade. Tungsten, antimony, copper, silver, lead, zinc and bismuth are other important mining products. Prior to the war Bolivia was producing approximately 240,000 barrels of petroleum annually. In 1942 the Bolivian government agreed to pay the Standard Oil Company of New Jersey $1,750,000 for oil property expropriated in 1937.

ITEMS

A MEDAL and a prize of $200 will be awarded each year by the newspaper *El Universal* for the best doctoral thesis in a Mexican university. This Justo Sierra prize is named after the Mexican educator and philosopher who reestablished at the turn of the century the University of Mexico after it had been decentralized for a century.

NINETY per cent. of all dates grown in the United States are produced in the Coachella Valley in California. The date crop this year amounts to nearly 20,000,000 pounds, worth about $5,000,000, according to Dr. Walter T. Swingle, who had much to do with the introduction of date culture in this country. Date growing on a major scale was begun in the Coachella Valley, which lies north of Imperial Valley, about the turn of the present century, and is now the principal industry of the region. Irrigation water comes from deep wells. Cull dates, unmarketable for food purposes, are fermented for the production of industrial alcohol.

A RECORD-BREAKING electric motor, which operates at 120,000 revolutions a minute, has been developed, built and thoroughly tested by the General Electric Company. This new three-horsepower motor weighs only seven pounds and is so small that it will fit into the palm of a man's hand. The motor is water-cooled and is equipped with oil-mist lubricating bearings. Tests, including a continous run of eight hours, are said to have proved its perfection. The ordinary three-horsepower electric motor weighs 105 pounds. The speed of rotation of this new motor is 65 times faster than the conventional motor used in home washing machines and refrigerators. Motors of this type will be used for the grinding and drilling of essential parts of airplanes and other war equipment and will not be available for general use until after the war.

Through an editorial slip on a Science Service typewriter Dr. C. A. Browne was credited with the statement that Humboldt "at the beginning of the nineteenth century set Mexico at the head of all Western Hemisphere nations in cultural attainment." (Science News, Jan. 21, p. 12.) The article should have stated that Humboldt placed Mexico at the head of all Latin American countries.

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1155 Illus., Mostly in Colors. 1641 Pages. $12.00 (1942)

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SCIENCE NEWS

Science Service, Washington, D. C.

LEAP YEAR

EVERY fourth year having an extra day is called Leap Year because during the twelve months following February 29 a date "leaps over" or skips a day of the week, causing dates to fall two days later in the week instead of just one. Whenever the number of the year is divisible by four, with the exception of century years not divisible by 400, an extra day at the end of February is introduced.

The ordinary year of 365 days contains 52 weeks and one day. This extra day causes a particular date to fall one day later in the week than during the previous year. But when there is a leap year, which contains 52 weeks and two days, any date in the twelve months after February 29 falls two days later in the week instead of just one. New Year's day, for example, was on Friday in 1943, and on Saturday in 1944, but in 1945 it will skip Sunday and fall on Monday.

Leap Year was introduced because the earth does not turn on its axis an exact number of times during one entire revolution around the sun. In the Julian calendar, inaugurated by Julius Caesar in 45 B.C., the year was assumed to contain 365¼ days, or 365 days and 6 hours.

The extra hours can not be included in the year until they have accumulated to a whole day. By the advice of the astronomer Sosigenes, Caesar decreed that the Roman year should consist normally of 365 days, but that every fourth year should contain 366 days.

The true period of the earth's revolution around the sun is 365 days, 6 hours, 9 minutes, 9.5 seconds. This sidereal year is the time taken by the sun to complete the circuit of the heavens from a given star back to the same star.

The year which is used in every-day life, however, is one which depends on the seasons. Because of a slow wobbling motion of the earth called precession, the equinox moves gradually westward and the tropical year, that is, the interval between two successive arrivals of the sun at the vernal equinox, is about 20 minutes shorter than the sidereal year. Its length is 365 days, 5 hours, 48 minutes, 46 seconds. Thus the average year in the Julian calendar was 11 minutes and 14 seconds or 0.0078 day, too long.

This error of 0.0078 day per year adds up to one day in about 128 years, or causes an error of about three days every 385 years.

In the course of a thousand years the Julian calendar loses nearly eight days. Pope Gregory XIII proposed a calendar reform which would make the date of the vernal eqinox the same as in the year 325 A.D., at which time the Council of Nicaea decided upon the method of reckoning the date of Easter. Between 325 and 1582, the date of the vernal equinox had moved, in the Julian calendar, from March 21 to March 11. The Pope directed that ten days be dropped from the calendar so that the vernal equinox would once again fall on March 21. For people living in Catholic countries the day after October 4, 1582, became October 15. Other countries gradually adopted this change.

Since an error of about three days was introduced every 385 years by the Julian calendar, Pope Gregory XIII decreed that the rule of adding an extra day every fourth year should be followed except in the case of those century years whose number is not divisible by 400. Thus the year 2000 remains a leap year, but 2100, 2200, and 2300 will have only 365 days.

AN ELECTRONIC TRAIN TELEPHONE SYSTEM

A TWO-WAY electronic train telephone system which permits freight conductors and engineers to talk with each other or with block operators is now in operation on the 67-mile Belvidere-Delaware branch of the Pennsylvania Railroad.

This unique system, the first to be established up to the present time, will be used on freight trains only until it is more thoroughly tested. Installation of the necessary equipment has been made on ten locomotives and in ten cabin cars. It has also been made in one block station, at Frenchtown, N. J., and is under way in another block station at Trenton, N. J.

High-frequency alternating currents are used in the new system. They are transmitted along the rails, and also along wires on poles parallel to the track. They are termed "carrier" currents. They have impressed upon them the impulses of the telephone currents produced by talking into the telephone instruments. These electrical impulses are transformed back into sound by the receiving sets in the locomotives, cabs or block station.

The system will be used at present for operation purposes only. Train crews will be able to report to block station operators and to get orders from them. Conductors and engineers will be able to talk to each other at will, and also to communicate with other trains within several miles' distance.

This new train communication system was produced in collaboration with the Union Switch and Signal Company, following several years of intensive experimentation and development. Further installations are planned after this first one has been given a thorough trial in practical operation.

PURE METALLIC MANGANESE

PURE metallic manganese is produced in the United States by an electrolytic process recently developed in this country. The process was put into operation commercially on a small scale in 1939, but in the past two years production has expanded until now some four tons a day are made. This probably meets important war needs.

Electrolytic manganese and its alloys were discussed by Dr. R. S. Dean at the New York meeting of the American Institute of Mining and Metallurgical Engineers.

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Teachers have welcomed *Biology: The Science of Life* as a notable addition to those few elementary biology texts that truly deserve to be called distinctive. The following comments are representative:

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Virginia Polytechnic Institute

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The balanced treatment is a feature of the book, and the practical applications of biology, interesting as they are, are not emphasized at the expense of the fundamentals of the study. On the other hand, more attention than usual has been given to recent advances in such fields as genetics, and considerable stress is placed upon human biology and welfare.

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The electrolytic process of obtaining pure manganese is an achievement of the Metal Division of the U. S. Bureau of Mines. The development work was carried out under his leadership.

For the first time in the history of the institute an entire session was devoted to manganese because of its importance as a war metal. Electrolytic manganese, the speaker stated, is used in the production of magnesium bomb cases, high expansion alloys important in control instruments for warships and planes, stainless steel, many high-strength bronzes, and in the new five-cent piece which is no longer nickel but an alloy of pure manganese, copper and silver.

Manganese in an impure form has been used for years in steel-making. The pure manganese, used in non-ferrous alloys, may be obtained from low-grade ores available in this country by this new process. The older methods of producing manganese alloys in the blast furnace and electrical furnace are adaptable only to high-grade ores not available here.

INSECT EGGS

THAT insect eggs are often highly dependent on the amount of moisture present in their surroundings, was pointed out by Professor Daniel Ludwig, of New York University, at a meeting of the New York Entomological Society.

Some species, like the Japanese beetle, lay eggs that soak up moisture as seeds do, and will not hatch unless they get this extra water. The eggs of the Japanese beetle increase three times their original weight by such imbibed water.

Professor Ludwig's principal studies recently have been on the water relations of eggs and pupae of the saturniid moths, such as the Luna, Promethea and Cecropia moths. Their eggs will take in water from very damp air, but do not need such moisture for their development; they will hatch even in dry air if it is is warm enough. However, if the air is either a little too warm or a little too cool the amount of moisture present will influence the hatchability of the eggs. As might be expected, there are differences in the behavior of the eggs of different species. Thus, Polyphemus moth eggs will hatch in hotter, drier air than the eggs of other species can endure.

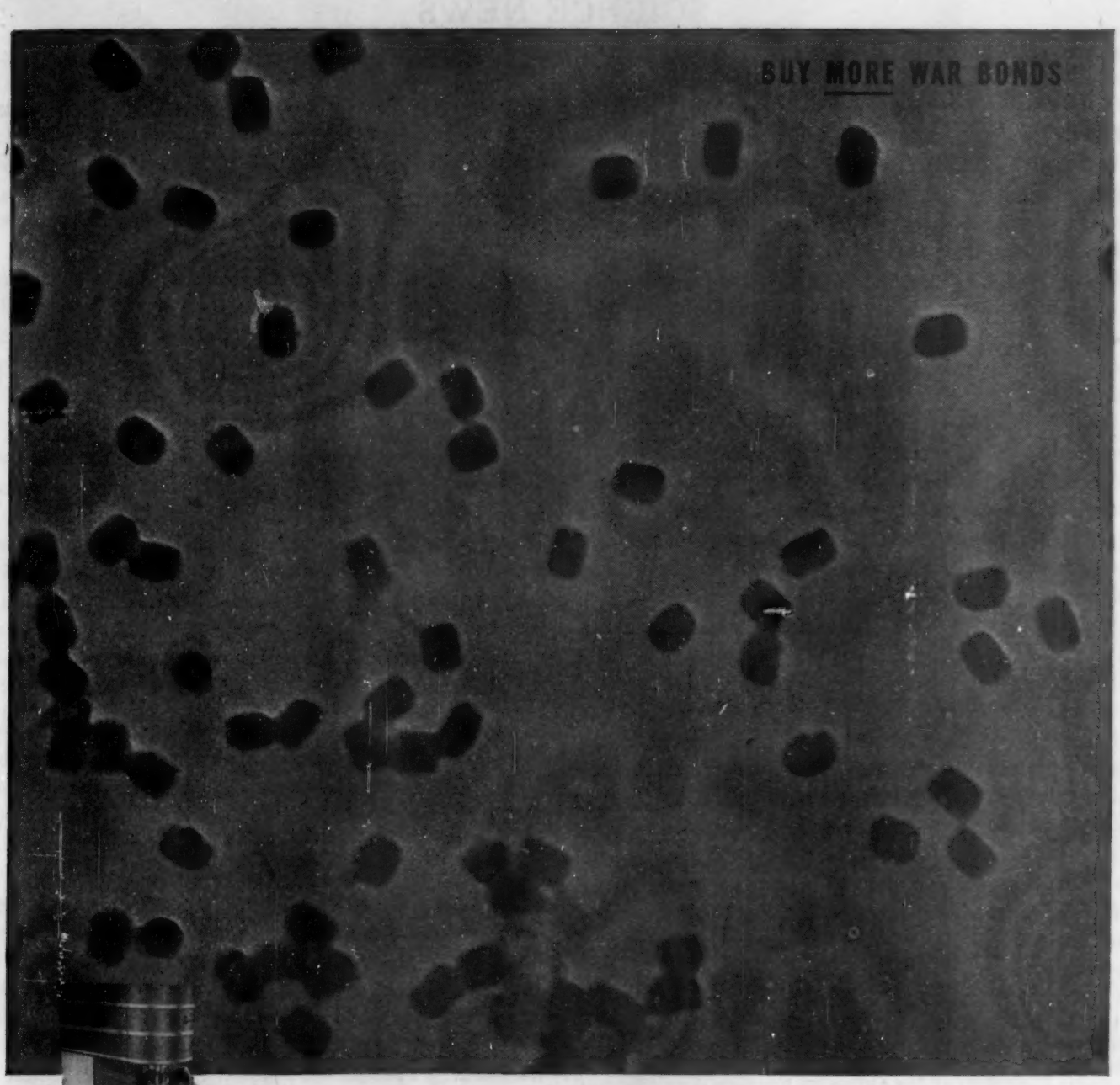
Drying of the pupae during the winter had adverse effects on reproduction after the adult moth had emerged in spring. In some cases fewer eggs were laid, in others the eggs that were laid failed to hatch.

ITEMS

AMERICA'S known reserves of potash have received a substantial addition through the discovery of thick beds of potash-containing minerals underlying a large area in eastern Utah, according to B. W. Dyer, of the U. S. Geological Survey, in a report made to a joint meeting of the Society of Economic Geologists and the American Institute of Mining and Metallurgical Engineers. The first hints of the presence of potash deposits in this region were given twenty years ago, when the minerals appeared in the logs of exploratory borings made by an oil company. There was a brief flurry of interest then, but presently it subsided and the whole matter was practically forgotten. After the United States was involved in the war, interest in the possible mineral beds was revived, partly because one of the minerals contained a high percentage of magnesium as well as potash. The Defense Plant Corporation put down some deep holes, and geologists studying the samples brought up found that there are three beds of potash minerals at depths between 3,300 and 4,200 feet. The thickest bed is more than 90 feet from top to bottom. The area is served by a railroad, the Denver and Rio Grande, so that transportation is readily available in case economic exploitation of the deposits is undertaken.

PENICILLIN in the large quantities demanded by wartime hospital service is being produced through adaptations of mass culture methods developed in the U. S. Department of Agriculture for the commercial production of citric, gluconic and other organic acids. The labor, and hence the cost, per unit of production is greatly reduced by this method, which was first developed 15 or 20 years ago, long before penicillin was even thought of. This is only one of the concrete benefits which research in the Department of Agriculture has brought to the national war effort, and can be expected to extend into the years of peace that will follow victory. Some of the others are described in the report of E. C. Auchter, Research Administrator. Among the new fruits of past research are the release for general use of 35 improved new strains and varieties of crop plants, reduction of the ripening time in Cheddar cheese by 50 per cent., more efficient ways to keep discomfort-producing and disease-bearing insect pests like lice and mosquitoes away from our soldiers, development of many new foods from soybeans, finding and growing new plant products to replace those cut off on account of the war.

A PIECE of newspaper and hydrochloric acid, familiar to every high school chemistry student, are the materials with which a new sulfa drug test has been developed by Captain Robert Hubata, S.C., A.U.S. The test is reported in *War Medicine*. The simple test will be valuable, Captain Hubata believes, in determining whether or not a person has taken a sulfa drug. It is made by moistening a small area on a blank strip of newspaper with a drop or two of a specimen of urine from the person being tested. A small drop of dilute hydrochloric acid, one part acid in four parts of water, is then placed on the center of the moistened area. The immediate appearance of a yellow to orange color shows the presence of a sulfonamide compound. The method is based on the color reaction in the presence of acids between crude cellulose, such as newspaper, match sticks or pine shavings, and the arylamine group. Paper from refined pulp, for example white bond, will not give the reaction. The color varies from orange yellow to orange, the yellow color, or one plus reaction, being obtained from persons who have recently stopped taking a sulfa drug.



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Science Service, Washington, D. C.

PENICILLIN AND PSITTACOSIS

HOPE that penicillin may prove a remedy for psittacosis and the related disease, ornithosis, is held by Dr. F. R. Heilman and Dr. W. E. Herrell, of the Mayo Clinic at Rochester, Minn., on the basis of experiments with mice.

Psittacosis, or parrot fever, became generally known in this country in the winter of 1929–1930 during an outbreak in which almost one fifth of the patients died. Chickens, doves and many types of finches and pigeons as well as parrots may be infected with the virus of the disease. This has led to the adoption of the name ornithosis for the sickness in man when it is not definitely due to association with parrots or lovebirds.

The ornithosis virus may frequently cause atypical pneumonia in man, according to findings by a number of physicians. So far, no remedy, including the sulfa drugs, has proved effective in ornithosis in man or laboratory animals.

In their tests with mice, 80 animals were inoculated with the virus of ornithosis. Of 40 that were not given penicillin, 35 died. Of 40 treated with penicillin, only two died.

"The results of these studies and the close relationship between the strains of the viruses of ornithosis and psittacosis make it hopeful that penicillin will have a favorable therapeutic effect on these virus infections in man."

The penicillin used in the experiments was provided by the Office of Scientific Research and Development from supplies assigned by the committee on medical research for experimental investigations recommended by a committee of the National Research Council.

FOOD SUPPLIES IN GERMANY

DR. J. H. RICHTER, of the Office of Foreign Agricultural Relations, U. S. Department of Agriculture, stated in the official publication, *Foreign Agriculture,* that, in his opinion, Germany's production and consumption of food thus far in this war have been at a level far above those for 1914–1918.

"In contrast to the situation in 1914, Germany's food economy in 1939 was well prepared for war. Following a period of sustained expansion, agricultural production had reached a high level. Over 85 per cent. of the nation's food supply was produced from domestic resources, the only substantial deficit being in fats and oils. From 1937 until the outbreak of war, stocks of grain, fats and sugar had been accumulated in considerable quantities." In the years just prior to World War I, German livestock was dependent upon the importation of feed to the extent of about 38 per cent. of the total output of livestock products. In 1939 the dependence on imported feeds was not more than 10 per cent., with the result that livestock production has been considerably less affected in the past four years than during the 1914–1918 period.

An important factor in the high level of farm production was the relatively large supply, up to 1943, of commercial fertilizers other than phosphates. Especially important was the availability of nitrogen in quantities six or seven times as great as in the previous war. "This excess, even after allowance has been made for the drastic reduction in phosphates, may still be estimated as accounting for an annual crop production of over 6,000,000 tons in terms of grain."

In the opinion of Dr. Richter, Germany's own production has remained the backbone of its wartime food supply, despite the importation of substantial quantities requisitioned in other parts of continental Europe under German control.

ITEMS

PINK bollworm, one of cotton's worst insect enemies (the other is boll weevil), has been found in Louisiana, according to the U. S. Department of Agriculture. Hitherto this pest has been known only from portions of Texas, New Mexico and Arizona. Because of the immediate seriousness of the situation, extension of quarantine regulations to include Louisiana is under consideration. A hearing to consider the matter was planned to be held in the Federal Building at Memphis, Tenn., on March 1.

ALMOST one and a quarter billion pounds of waterproof paper will compete with metal and wood containers during 1944. Large amounts are used for waterproof tarpaulins for landing posts and beachheads. About 8,000,000 to 10,000,000 pounds of the waterproof paper are used each month for shell cases alone. Since there will be no adequate indoor storage for about 70 per cent. of the supplies they are being shipped to liberated countries abroad in waterproof shipping bags. Demands for waterproof paper have nearly doubled since last August, largely because of the requirements of our armed forces, according to G. E. McCorison, of the War Production Board's Paper Division. Paper is wet-proofed by several different processes. Asphalt is used to laminate sheets of paper. A water-repellent coating is applied to paper. Or paper is given wet-strength by the addition of a synthetic resin to the pulp. All these processes make it possible to leave paper bags and their precious contents in the open without fear of the elements.

DR. EDWIN J. COHN, of the Harvard Medical School, recently reported to the New York Section of the American Chemical Society that from the proteins in blood plasma it has been possible to make plastics, films and foams for clinical use, as well as the more familiar immune globulin for measles prophylaxis and isohemagglutinins for blood typing. The plastics are made from fibrinogen, the substance in blood upon which the physical properties of the blood clot largely depend. In connection with thrombin this can be made into fibrin films used as membranes, and into the fibrin foams used to check bleeding in surgery on the nervous system. Albumin from blood, also available now as a stable, dry, white powder, is put up in a 25 per cent. water solution in the 100 cubic centimeter Army-Navy package and used for treatment of shock. This approximately three-ounce solution is equivalent to a pint of blood plasma.

WILEY

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An elementary textbook and laboratory manual. The fundamental concepts and the more important types of organic compounds are discussed as early as possible, and are constantly used throughout the remainder of the book.

(1941) *248 pages; 6 by 9; $2.50*

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(1942) *506 pages; 6 by 9; $3.50*

AN INTRODUCTION TO ORGANIC CHEMISTRY

By IRA D. GARARD.

A revised and somewhat enlarged edition of a well-known book for brief introductory courses. The simplicity of the laboratory apparatus and manipulation has been retained.
Second Edition (1940) *389 pages; 6 by 9; $2.75*

AN INTRODUCTION TO ORGANIC CHEMISTRY

By the late ALEXANDER LOWY and BENJAMIN HARROW.

This book gives broad principles and general reactions in a readable form. It emphasizes the connecting links that bind organic chemistry to medicine, dentistry, pharmacy, and other biological sciences.
Fifth Edition (1940) *400 pages; 6 by 9; $3.00*

TEXTBOOK OF ORGANIC CHEMISTRY

By GEORGE HOLMES RICHTER.

A comprehensive, teachable textbook, revised to include current subjects of importance. Excellent as the foundation for a solid course for beginning students.
Second Edition (1943) *760 pages; 6 by 9; $4.00*

LABORATORY MANUALS

Laboratory Outlines and Notebook for Organic Chemistry

By CECIL E. BOORD, WALLACE R. BRODE, and ROY G. BOSSERT.
241 pages; 8¼ by 10½; Paper; $1.75

Laboratory Manual of Organic Chemistry

By HARRY L. FISHER.
Fourth Edition (1938) *412 pages; 5½ by 8½; $2.75.*

Laboratory Book of Elementary Organic Chemistry

By the late ALEXANDER LOWY and WILMER E. BALDWIN.
Second Edition (1934) *182 pages; 8½ by 11; $2.50*

Laboratory Manual of Elementary Organic Chemistry

By GEORGE HOLMES RICHTER.
(1940) *128 pages; 6 by 9; $1.25*

JOHN WILEY & SONS, Inc., 440-4th Ave., New York 16, N. Y.

SCIENCE NEWS

Science Service, Washington, D. C.

THE SCIENCE TALENT INSTITUTE

THE most talented young scientists in America went to Washington on Friday, March 3, to attend the Science Talent Institute conducted by the Science Clubs of America, and to compete for Westinghouse Science Scholarships.

Selected in the nation-wide third annual Science Talent Search with nearly 15,000 entries, all seniors in secondary schools, these boys and girls listened to a score of eminent scientists, visited scientific institutions in the nation's Capital, and made plans for pursuing scientific research careers. Those invited numbered 40, of whom 28 were boys and 12 girls.

Dr. Karl Compton, president of the Massachusetts Institute of Technology and member of the National Defense Research Committee, made the principal address of the meeting when on Tuesday evening (March 7) an awards banquet was held. At this time the scholarships were announced. One boy and one girl received $2,400 scholarships to be used at universities of their own choice. Six boys and two girls were given $400 scholarships, and $3,000 more in scholarships were distributed. Their scientific hobbies and experiments were demonstrated by the youthful winners on Saturday evening.

After a luncheon at noon on Saturday, leaders in science discussed with the boys and girls the opportunities for service in scientific research for war and peace. Dr. Leonard Carmichael, president of Tufts College and director of the National Roster of Scientific and Specialized Personnel, and Walter J. Murphy, editor of *Industrial and Engineering Chemistry*, participated.

Lectures of the Science Talent Institute began with a program on Friday evening during which Dr. Samuel G. Hibben, director of applied lighting, Westinghouse Electric and Manufacturing Company, staged a demonstration of "Lighting Tomorrow."

On Saturday morning there were three speakers: Dr. A. N. Richards, from the University of Pennsylvania and now chairman of the Committee on Medical Research of the Office of Scientific Research and Development, spoke on "Medicine in War and Peace"; Dr. Margaret Mead, associate curator of the department of anthropology of the American Museum of Natural History, answered "Can Women Re-make Our World?" "Navigation in Emergencies" was discussed by Dr. Bart J. Bok, associate professor of astronomy, Harvard University.

At the fourth session of the institute on Monday morning the speakers and their subjects were Dr. W. C. Lowdermilk, assistant chief, Soil Conservation Service, U. S. Department of Agriculture, "Food from Soil"; Dr. Marshall H. Stone, president, the American Mathematical Association, "New Steps in Mathematics," and Dr. E. U. Condon, associate director, Westinghouse Research Laboratories, "Frontiers of Atomic Physics."

A Nutrition Luncheon was held at noon on Monday to demonstrate new methods of feeding fighting men and civilians at home and abroad. Dr. Henry C. Sherman, chief, Bureau of Human Nutrition and Home Economics, U. S. Department of Agriculture, spoke at that time on "Trends in the Science of Nutrition."

The afternoon session on Monday included Pin Chuan Ho, professor of physics from China, who discussed "The Future of Science in China"; Dr. A. Allan Bates, manager, Chemical and Metallurgical Department, Westinghouse Electric and Manufacturing Company, who reviewed "Advances in Metallurgy"; and Dr. R. G. Robinson, of the National Advisory Committee for Aeronautics, who spoke on "Aeronautics."

A special Educational Luncheon Conference was held on Tuesday, March 7. It was attended by educators invited from all parts of the United States and the discussion centered around the methods of selection of promising young scientists. Dr. Morris Meister, principal of the Bronx (N. Y.) High School of Science, G. Edward Pendray, assistant to the president of Westinghouse Electric and Manufacturing Company, and Dr. Harlow Shapley, director of the Harvard College Observatory, led the round table discussion.

The Annual Science Talent Search is the joint effort of Science Clubs of America administered by Science Service and the Westinghouse Electric and Manufacturing Company.

ITEMS

NOT concentric circles but complicated ovals, or even curves running off the paper, should be used to correctly map on a flat surface airplane ranges of 500, 1,000, and 1,500 miles or more was pointed out by Professor Edward Kasner, of Columbia University, and Professor John DeCiccio, of the Illinois Institute of Technology, in a paper presented to the New York meeting of the American Mathematical Society. Concentric circles of a sphere can not accurately be represented by concentric circles in a plane. "A map is not a perfect picture, but at best a systematic caricature," Professor Kasner stated. The surface of a sphere, or any part of that surface, can not be mapped on a plane with exactitude.

LARGER iron ore deposits have been found to exist in the West than were formerly known. It is now believed that our local reserves will be sufficient to supply for the duration of the war the iron and steel furnaces with this important ore. Deposits containing more than 150,000,000 tons of iron ore, vitally needed for war production, have been charted by the U. S. Geological Survey, this work in some instances being supplemented by core drilling by the U. S. Bureau of Mines was recently reported by Dr. Charles F. Park, Jr., and Ernest F. Burchard, of the U. S. Geological Survey, to members of the Society of Economic Geologists and the American Institute of Mining and Metallurgical Engineers. The largest of these deposits were found in California and Utah. Because of the remoteness of transportation facilities and water supplies, not all of this ore is immediately available.

PHYSICS

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Teachers say: "I like its method of approach, style and development, and its appeal to young engineering students and those interested in science."

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THE BLAKISTON COMPANY

PHILADELPHIA 5, PA.

SCIENCE NEWS

Science Service, Washington, D. C.

PSYCHOLOGICAL HAZARDS FOR FLYING FIGHTERS

DR. WALTER R. MILES, professor of psychology at Yale University, in the first of a series of twenty-five Sigma Xi lectures, calls attention to the fact that being ready to fight and then not having a chance at the enemy in the air presents one of the greatest psychological hazards in the air war for our flying fighters.

During long-range photographic reconnaissance, with no active fighting, the "gremlins" first made their appearance. Long stretches of readiness, without combat service, are characteristic of military aviation and may present severe psychological stresses. He pointed out that "Change of schedule in active flying service is also psychologically hazardous, thus the cancellation of a bombing mission exacts an emotional cost which needs to be appraised and appropriately dealt with before the same crew is scheduled for its next operational duty. The practical psychological skill of the flight surgeon in appraising stress, developed either from readiness or combat or from both, makes an important contribution to the efficiency of the air force in all such problems as these. If the psychological elements in the case of a given military flyer can be properly appraised and skillfully directed by a flight surgeon, crew captain or other insightful guide, the chances are multiplied against 'his number coming up.'"

Dr. Miles told how psychologists and many other specialists are conducting research on many phases of military aviation to help the men in our fighting planes to achieve greatest effectiveness. Much of what is being learned and applied with success will be useful in developing air transportation of the post-war era, he predicted.

"In aviation the number of hours of training or flying have in the past served as a measure of learning progress or flight competence," Dr. Miles said in explaining one advance. "But clearly instruction, in terms of basic maneuvers and repetitions of these in practice, is obviously much more fundamental for learning than hours in the air as such, and other contributions to effective progress can come through the reinforcement to the practical experience in the air from prior mental rehearsal in which the whole routine is repeated again and again. Sport has long recognized this principle in the coaching of individuals and teams."

High altitude flying is one of the great problems of the present war and the adjustment of the human body and mind to the reduced pressure of the atmosphere and low temperatures encountered can be studied in a decompression chamber. Vision presents many important psychological problems. One of these is peripheral vision or looking out the side of the eye which is necessary in landing of planes. The dark adaptation of the eyes must be protected from the lighting within the plane in night flying and the study of this problem has influenced selection of pilots and the development of new equipment and training methods.

ITEMS

ZERO octane gasoline, not the much discussed 100-octane aviation fuel, may be used in the future to power the family car. This possibility is advanced by Dr. Carlton H. Schlesman, head of the research laboratories of the Socony-Vacuum Oil Company. He states that a "most radical power plant" is already under development which makes use of radiant energy from low-grade fuels. In this new engine, he said, "Fuel of low or even zero octane number is burned inside a gas mantle. Radiant energy is thus produced at high efficiency. This energy impinges on photo-electric cells which convert it into electrical energy. Such energy drives small electric motors mounted at the wheels." The necessary light-weight, high-powered electric motor, up to now the missing link in the evolution of this new power system, has been developed and is available for use.

BOTH tin plate and zinc-coated steel sheets are produced interchangeably on the same electroplating lines in a new precision unit of the Weirton Steel Company. Three lines of electrically operated equipment, each 400 feet long, turn out electrolytic zinc-coated sheets at the rate of 160 feet a minute. The equipment is the type developed recently for tin-plating that has revolutionized the production. For zinc coating a bath is made with zinc chloride, sodium chloride and aluminum chloride. The electric current carries zinc from pure zinc fixed terminals and deposits it on the moving metal sheets. Low-voltage generators deliver 60,000 amperes of power to the plating unit at all times while in use. Tests of the product show, it is claimed, that there is much tighter bond between the zinc and the steel plate than can be obtained by the older hot-dip method.

ALUMINUM may perhaps be produced from clay or other materials than bauxite at a cost that will compete with its manufacture from bauxite, even without substantial income from by-products. This opinion was expressed by F. R. Archibald and C. F. Jackson, scientific consultants of the Ancor Corporation, speaking at the meeting of the American Institute of Mining and Metallurgical Engineers. They believe, on the basis of research tests, that there are localities where reserves of the needed raw materials occur in large quantities and of high purity within economical radius for bringing them together. If other economic conditions are satisfactory, production of alumina from materials other than bauxite would be profitable. High-alumina clay, limestone and coal are three materials needed in large quantities. Two tons of limestone are required for each ton of clay. Fuels other than coal may be used. A South Carolina kaolin-type clay, as a source of alumina, has been successfully used in a pilot plant demonstration, and a commercial plant is now under construction in that state. Portland cement may be made from by-products.

WILEY

NEW WILEY BOOKS

MATHEMATICS FOR EXTERIOR BALLISTICS

By GILBERT AMES BLISS, *Professor Emeritus of Mathematics, University of Chicago.*

This book is suitable for use in courses in exterior ballistics. It is written for mathematicians and students of mathematics who have had some experience with the theory of differential equations. The first chapter describes the sources of the data on which the fire control officer bases his use of mathematical tables in the field. The book then discusses, for the most part, the setting up of differential equations of a trajectory and methods which are used to integrate them, including methods of computation of differential corrections. *Ready in April.*

Approx. 131 pages; 5¼ by 7¾; Probable price, $1.75

REVIEW OF PHARMACY

By GEORGE W. FIERO, *Associate Professor of Materia Medica, University of Buffalo School of Pharmacy.*

For the pharmacist or student who desires a ready reference on the official drugs and preparations. The book is distinguished for its completeness, brevity and comprehensibility. Briefly, it represents a condensed compend of the drugs, chemicals and preparations of the United States Pharmacopoeia (latest edition) and the National Formulary (latest edition). Special attention has been given to the form in which all data are presented, in order to make the book a quick, handy reference of maximum usefulness. *Ready in March.*

Fifth Edition: Approx. 120 pages; 6 by 8¾; Probable price, $2.50

INDEX FOSSILS OF NORTH AMERICA

By HERVEY W. SHIMER, *Professor Emeritus of Paleontology,* and ROBERT R. SHROCK, *Associate Professor of Geology; both at Massachusetts Institute of Technology.*

Replacing the original Grabau and Shimer's "North American Index Fossils," this is a reference work for lecture and laboratory study in advanced courses in invertebrate paleontology. It will also be of value for various theses investigations in paleontology and stratigraphy. No comparable book exists: There are over 9,400 individual illustrations; approximately 7,500 species are described and figured. Specialists in nearly all the larger divisions have either revised the material in the book or have assisted the authors in doing so. *Ready in May.*

837 pages; 7½ by 10¾; $20.00

ORGANIC REACTIONS, Volume II

ROGER ADAMS, *University of Illinois, Editor-in-Chief.*

Like Volume I (1942, $4.00), this volume presents, from the preparative viewpoint, critical discussions of widely-used organic reactions. It covers: The Claisen rearrangement; the preparation of aliphatic fluorine compounds; the Cannizzaro reaction; the formation of cyclic ketones by intramolecular acylation; reduction with aluminum alkoxides (the Meerwein-Ponndorf-Verley reduction); the preparation of unsymmetrical biaryls by the diazo reaction and the nitrosoacetylamine reaction; replacement of the aromatic primary amino group by hydrogen; periodic acid oxidation; the resolution of alcohols; and the preparation of aromatic arsonic and arsinic acids by the Bart, Bechamp, and Rosenmund reactions. *Ready in April.*

461 pages; 6 by 9; $4.50

JOHN WILEY & SONS, Inc., 440-4th Ave., New York 16, N. Y.

SCIENCE NEWS

Science Service, Washington, D. C.

WATERPROOFING SOIL

THE development of a chemical which may end muddy streets and country roads, and prove a time-saving aid in construction work where mud may cause delays, has been announced by the Hercules Powder Company. Designed to prevent mud by making soil waterproof, this resin compound has already been successfully used on roads, airplane landing fields and other construction projects here and abroad.

Areas treated with the resin compound may be used for construction traffic immediately after rain without danger of bogging down or rutting the surface. A car splashing through a puddle on a treated dirt road will kick up dry dust—not mud—behind it.

By mixing the resin compound, called Stabinol, with the top few inches of soil, a waterproof surface is obtained. It will not allow the water to seep through the treated soil and turn it into mud. It also resists the rise of moisture from below by capillary action. The water either is drained off or evaporates.

The product is a combination of a specially treated resin and other chemicals in the form of a dry powder suitable for easy mixing with the soil. The treated soil looks just like the original dirt.

Only a small amount of the resin compound is required, usually about one per cent. of the total soil to be treated, and the material itself is quite inexpensive, costing well under ten cents a pound. Although the amount varies with the composition of the soil, on the average about five pounds is needed per square yard. The soil stabilization it is believed will last for years.

It does not increase the load-bearing capacity of soil, but prevents the soil from getting wet and thereby losing its strength. The material is not a soil binder and should be used only with soils that have sufficient natural bonding material. It has been found effective with a wide range of soils, and particularly with those having relatively high silt or clay content.

Several types of resin stabilizers, developed by Hercules Powder Company during its investigations on soil stabilization, have been used to treat roads and streets, airplane landing fields and parking lots. Vinsol, an all-rosin product which made the soil water-repellant, was first tried. Other resin products, chemically treated to give the soil stabilizing characteristics also have been tried.

Stabinol is not offered as a "cure-all." Before soil can be treated, samples must be analyzed to determine whether the treatment will be effective and the proportion needed for satisfactory results. The company maintains a soil laboratory at Wilmington for this purpose.

ITEMS

PRIORITIES for science laboratories for facilities for assisting the war effort have now been amended and clarified by the War Production Board. Procedure for obtaining controlled materials is simplified. A new procedure has been set up for obtaining certain essential materials referred to in previous orders as Class A products. Previous restrictions on the quantity of aluminum that may be obtained are removed. Priorities assistance may be used for laboratory construction jobs costing not more than $500, the cost of labor and equipment not included. Hand tools and safety equipment bought by a laboratory for resale to its employees may be obtained under the amendments. Priority ratings assigned by the War Production Board to assist science laboratories may be used to get materials for development of products designed primarily for future civilian markets only if such activities will be carried on without diverting manpower, technical skills or facilities from war work.

AN announcement that capsules for prevention of seasickness and other kinds of motion sickness will be generally available to U. S. Army medical officers this spring appears in the *Bulletin* of the U. S. Army Medical Department. Officially known as Item 12960, Motion Sickness Preventive, U. S. Army, six capsules in a box, the preventive is expected to be useful in amphibious operations and transportation of personnel by sea and possibly also for prevention of air sickness. At least 50 per cent. reduction in occurrence of motion sickness can be achieved, it appears, from tests of the preventive that have been made over several months in continental United States and from limited tests under actual field operations. The ingredients of the preventive are being kept secret, but it contains a sedative. When used in accordance with the directions printed on the box, it has no significant untoward effects. Because of the sedative in it, however, excessive use may cause drowsiness with resulting decrease of physical efficiency.

SILVER powder, in a new ceramic type composition for use as a coating on electrically non-conductive materials such as glass and wood, gives the surface high electrical conductivity and low electrical resistance. The new composition is applied by brushing, dipping or spraying, and dries in the air without heat application except in special cases. The new material, developed by E. I. du Pont de Nemours and Company, will be of value particularly in electrical condensers and other units employed in electric circuits. Several different forms are being made, each designed to meet the varying requirements of different base materials and degrees of adherence and film toughness. All are dull metallic gray in appearance, and are little affected by aging.

ALASKA'S known mineral wealth is immense; it is suspected that the riches yet to be discovered are still greater. Under the spur of war needs, diligent surveys are now under way, according to Dr. John C. Reed of the U. S. Geological Survey. During the past year, 39 field geologists worked in the great territory, under the direction of five supervisors, each experienced in the region under his direction. Activities included the study of deposits of molybdenum, zinc, iron, copper, chromium, nickel, quartz crystals, coal, tungsten, asbestos, graphite, tin and mercury.

BLAKISTON BOOKS

The "Particles" of Modern Physics

By J. D. STRANATHAN, University of Kansas

218 Illus.
571 Pages
$4.00
(1942)

Making things clear is one of the distinctive qualities of this book. Teachers say it is the best introduction to atomic physics that an undergraduate could have. The material is well balanced. The experimental evidence for each concept is stressed. The text is interesting to read and has a strong appeal to students.

Temperature Measurement and Control

By R. L. WEBER, Pennsylvania State College

183 Illus.
430 Pages
$4.00
(1941)

Defense efforts of the nation depend so much upon processes where temperature measurement and control is a highly important factor. This book gives both a good theoretical background and an adequate description of instruments. It is clear and teachable.

Acoustic Design Charts

By FRANK MASSA,
Brush Development Company, Cleveland

107 Charts
228 Pages
$4.00
(1942)

How to save many hours of tedious mathematical computation is the aim of this book. It is a quick, handy reference for those interested in the design or construction of electro-acoustic apparatus. Each chart is provided with families of curves making it possible to see immediately the parameters of a system. Sample problems illustrate clearly each chart.

Elements of Electro–Magnetic Theory

By A. WILMER DUFF and S. J. PLIMPTON,
Worcester Polytechnic Institute

86 Illus.
173 Pages
$2.75
(1940)

Delving right into the subject without too much review of simple things characterizes this text. It is also notable for the clarity of exposition. Although the treatment is short, the book contains the basic elements of electro-magnetic theory. It is a teachable text suitable for a brief intermediate course.

THE BLAKISTON COMPANY

PHILADELPHIA 5, PA.

SCIENCE NEWS

Science Service, Washington, D. C.

HILLCULTURE

COMMON weeds successful in checking erosion of productive cropland are regarded as more valuable than wheat or corn, according to a statement issued by the U. S. Department of Agriculture.

At a time when obtaining a maximum yield per acre is vital to victory, the U. S. Soil Conservation Service is developing new and more effective ways to halt fissuring and cross-wash of top-soil, which have already ruined 50 million acres of American farmland.

On the 1,700 acre experiment station at Beltsville, Md., of the Department, an effort is being made to single out those strains of plants that make the best growth on poor, eroded soils, require a minimum of cultivation, and at the same time bring in the best income for the farmer. This phase of conservation is called hillculture because it is designed to discover safe and profitable ways of farming steep lands.

Now under observation are trees that produce high-quality wood for furniture, poles and posts; shrubs bearing fruit that can be used for jellies and jams; grasses and legumes that are succulent feed for livestock.

Hillculture has under way such projects as production of sumac for use in tanning fine leathers, milkweed floss as a substitute for imported Java kapok, and devil's shoestring roots for the manufacture of insecticides. Remarkable progress has been made in improving the raising of tobacco on sloping land.

One of the outstanding achievements of hillculture has been in developing the shipmast locust for use as posts, a great improvement over the abundant crooked-trunk black-locust stock.

A nursery is maintained at Beltsville. It is used to increase the growth of superior erosion-resistant plants. Many native and exotic species and varieties are under study and propagation.

ITEMS

AN all-time record of 15,374,698 patients, exclusive of newborn babies and outpatients, were admitted to hospitals in this country during 1943, according to the annual census of hospitals of the American Medical Association. This figure is an increase of 2,829,088, or 22.5 per cent., over the previous year. Births in hospitals during 1943 were 1,924,591. The number of hospitals increased by 310, while the number of hospital beds increased by 265,427 plus 5,686 more bassinets. "This recent growth is the equivalent of a new 727 bed hospital for each day of the year." The enormous expansion is due to wartime needs. The largest gain in number of hospitals occurred in the federal group, which would include Army, Navy and Marine or Public Health Service hospitals, and Veterans Administration Facilities. This group now numbers 827, as compared with 474 in 1942; their bed capacity is given as 476,673, an increase of 255,735 since 1942.

WOOD veneer on metal surfaces is now possible with a new adhesive developed at Akron, Ohio, by scientists of the Goodyear Research Laboratory. With the new binding material, called Pliobond, a sheet of wood as thin as one forty-eighth of an inch can be firmly cemented to a metal sheet, and the combination can be bent into any chosen form or cut with shears or stamping press without injury. Steel, aluminum and other sheet metal, to which a thin layer of wood is attached with this bonding material, have many possible uses, including panelling walls in office buildings and homes, cabins in aircraft, and cars in light-weight streamlined trains. In veneering the metal, the Pliobond is spread on it, the layer of wood put in place, and moderate pressure and heat applied for 15 minutes.

COMPACT, lightweight, radio-noise filters, developed for use in aerial navigation, were described at the Cleveland meeting of the American Institute of Electrical Engineers by C. W. Frick and S. W. Zimmerman of the General Electric Company. The filters give excellent noise suppression, especially from 200 to 20,000 kilocycles, mounted in any position and operating over a wide temperature range. The new filters comply with U. S. Army Air Forces specifications, including the requirements for vibration and acceleration. It was pointed out that "careful planning is necessary to get the fullest use from both power and radio equipment, and not overburden the aircraft with attachments solely to make the radio work." As electricity is used for engine ignition, lighting, and many other purposes as well as for radio, the probability of interference with radio reception is high. These filters help to provide the high-fidelity radio reception necessary in aerial warfare.

A NEW alcohol process for the recovery of glycerin, basis of nitroglycerin, from domestic fats saved by housewives and butchers, has been developed and is now being satisfactorily used commercially by soap manufacturers, according to du Pont chemists. Recovery of the glycerin by this new method is said to be more economical than by the older processes, and also more complete. Equipment used is smaller and more compact. Iron vessels, instead of the more costly vessels of stainless steel or other alloys, may be used because the reaction is carried on at ordinary temperatures and pressure. And the glycerin produced is water-free. Soap manufacturers are permitted to continue to make soap only if they recover the glycerin from the fats for the Government's needs in war activities. Coconut oil, formerly imported from the Pacific islands and used in large quantities in making soap, is no longer available. For this reason every ounce of animal or other fat not consumed as food must be saved and made available for the explosives based on glycerin.

WILEY

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EXERCISES IN SECOND YEAR CHEMISTRY

By WILLIAM H. CHAPIN, *Emeritus Professor of Chemistry;* WERNER H. BROMUND, *Assistant Professor of Chemistry;* and LUKE E. STEINER, *Professor of Chemistry; all at Oberlin College.*

An extensively revised edition, with greater emphasis on methods of calculation applied in the mathematical treatment of fundamental theory. In Part I the experiments on the theory of ionization, homogeneous equilibrium, and heterogeneous equilibrium have been thoroughly revised and modernized; Chapter I contains much additional material of value in the laboratory work both in physical chemistry and in quantitative analysis. Part II likewise has been subjected to extensive revision, with more detailed discussion of the theoretical background and the procedures involved. *Published in March.*

Fourth Edition: 216 pages; 8⅝ by 10¾; Paper; $3.00

MATHEMATICS FOR EXTERIOR BALLISTICS

By GILBERT AMES BLISS, *Professor Emeritus of Mathematics, University of Chicago.*

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ORGANIC REACTIONS, Volume II

ROGER ADAMS, *University of Illinois, Editor-in-Chief.*

Like Volume I (1942, $4.00), this volume presents, from the preparative viewpoint, critical discussions of widely-used organic reactions. It covers: The Claisen rearrangement; the preparation of aliphatic fluorine compounds; the Cannizzaro reaction; the formation of cyclic ketones by intramolecular acylation; reduction with aluminum alkoxides (the Meerwein-Ponndorf-Verley reduction); the preparation of unsymmetrical biaryls by the diazo reaction and the nitrosoacetylamine reaction; replacement of the aromatic primary amino group by hydrogen; periodic acid oxidation; the resolution of alcohols; and the preparation of aromatic arsonic and arsinic acids by the Bart, Bechamp, and Rosenmund reactions. *Ready in April.*

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Fifth Edition: 117 pages; 6 by 8¾; $2.50

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SCIENCE NEWS

Science Service, Washington, D. C.

SOUTH AMERICAN OIL RESERVES

A VAST untapped region extending the whole length of South America promises rich oil reserves, according to Dr. John L. Rich of the University of Cincinnati who gave a report at the annual convention of the American Association of Petroleum Geologists. A belt bordering the eastern base of the Andes mountain system from Tierra del Fuego to the island of Trinidad is the area which he forecasts will be oil-productive. The belt is now productive in the Neuquen, Mendoza, and Salta regions of Argentina, in southern Bolivia, in central Peru and in Venezuela.

Though much of the sub-Andean belt is geologically favorable for the generation and accumulation of oil, the finding and development of that oil promises to be more than ordinarily difficult. Dr. Rich stated that "In much of the belt, except locally close along the mountain base, the prospective oil-bearing rocks lie at great depths, ranging up to 15,000 feet or more, and the structures will be difficult to find owing to a thick mantle of comparatively recent gravels, sands and silts spread eastward from the growing Andes, uncomformably burying the older rocks."

Transportation of the oil to market is another obstacle: "Some 1,600 miles of the sub-Andean belt, from central Bolivia to the Llanos of central Colombia, is an unbroken tropical rain forest where the heat and humidity are trying and where the presence of tropical diseases will require the utmost vigilance. Transportation in the region is not yet developed, and at best the distance to markets is very great."

According to Dr. Rich, one of the largest areas of potential oil territory, not yet productive, is the huge Parana Basin region of southeastern Brazil, Paraguay and northern Uruguay, where good showings of oil have been found in test wells.

"But most of the basin is covered by an enormous lava field which makes prospecting extraordinarily difficult," Dr. Rich says.

ITEMS

AMERICAN chemists participated in Mexico's Second National Conference of Chemists held in Mexico City during the week ending April 1. The principal theme of the meeting was the future of chemistry in the western hemisphere, particularly as it affects the expansion of Mexican industry. U. S. delegates attending as the guests of the Mexican Government were: Dr. Horace Porter, Philadelphia chemical engineer, Dr. J. Alfred Hall, prinicpal biochemist of the U. S. Forest Service, and Dr. R. O. E. Davis, U. S. Department of Agriculture chemist specializing in fertilizers. Dr. Rafael Illescas Prisbie, connected with a family prominent in California history, was elected president of the conference. A new film prepared by the Mexican Department of Health showing how pinta, sometimes called spotted fever, a contagious skin disease of Mexico and other tropical countries, is fought was shown to the meeting.

REPORTS of the possibility of producing a high-protein stock feed from wood waste, by a slight modification of a process for using the same kind of waste in the production of alcohol for war industries in the United States, have aroused great interest on the part of Mexican cattlemen. Dr. J. Alfred Hall, principal biochemist of the U. S. Forest Service, discussed the process at the meeting of the Mexico Conference. At the same time, an illustrated news feature by Science Service telling about it appeared in the Mexican newspaper, *El Universal*. The process, which consists of first converting wood cellulose into sugar by acid treatment, and then fermenting the sugar, was first developed in Germany, at the great Tornesch distillery near Hamburg. Technical knowledge of it was brought to the United States by the former owner of the plant, Erwin M. Schaefer, an anti-Nazi German, who is now preparing to supervise the installation of a new plant at Eugene, Ore.

A MACHINE for obtaining true perspective diagrams from maps and promising to be a boon to both wartime and peacetime cartographers, was introduced by Dr. W. H. Bradley, of the U. S. Geological Survey, at a meeting of the Geological Society of Washington. Devised by Dr. Bradley, K. E. Lohman, and A. H. Frazier, this machine is the first of its kind to make allowance for the curvature of the earth and for the refraction of air in translating maps into true perspective pictures. The invention, capable of handling maps of any scale range, can be operated to make as many control points as are desired, from which a profile of the region may be drawn, and the drawing refined further with the aid of photographs. The machine has been very successful in making perspective pictures of land as seen from the air and coast lines as seen from the sea.

"SPEED-UP" motion pictures in color are used in a new method of determining efficiency and economy of combustion in stoker fuel beds in industrial furnaces. Pictures were shown and the method explained by Otto de Lorenzi of the Combustion Engineering Company, New York City, at the Alabama meeting of the American Society of Mechanical Engineers. Ordinary motion pictures of stoker fuel bed movements are too slow to have value in studying the burning coal behavior. "The general impression gained, when looking into a stoker-fired furance, is that the fuel bed is motionless, incandescent and active. While the actual motion is very slow, nevertheless it is positive and regular. The slowness makes it difficult for the human eye to see, follow and remember successive steps during any given cycle. Consequently, to have a true picture of sequence of operation and resulting changes, the action must be speeded up." Interval photographs pieced into a continuous motion picture are found satisfactory for complete analysis of coal behavior in the various fuel bed zones. The exposure rate can be adjusted to secure any desired degree of speed-up. The studies made by this new method are being used in improved designing and engineering.

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SCIENCE NEWS

Science Service, Washington, D. C.

THE JANUARY ECLIPSE OF THE SUN

WORD has been received at the Harvard Observatory clearing house from astronomers at Lima, Peru, giving more precise observed times for the eclipse of the sun on January 25 than have heretofore been published. These make the actual duration of totality slightly more than 164 seconds, which is about three seconds less than the predicted duration.

Dean Godofredo Gracia, of San Marcos University in Lima, transmits the results of observations by Professor Alfred Rosenblatt and Juan M. Portocarrero. Their observations of the eclipse were made at the observatory in the Collegio San José in Chiclayo, Peru, close to the center of the path of totality and near where several other expeditions had made their headquarters, including the Mexican eclipse expedition headed by Dr. Joaquin Gallo, director of the National Observatory at Tacubaya.

An important moment during an eclipse occurs when the moon first touches the sun's disk, making what astronomers call first contact. It is very difficult to determine this time by observation precisely, whereas timing the moment of second contact, when the moon completes its job of covering the sun's brilliant disk, is considerably easier because at second contact the last ray of direct sunlight is hidden by the moon just as if a camera shutter had been closed.

The predicted time for the second contact of the January 25 eclipse, according to the calculations, was 14 hours 7 minutes 33.6 seconds, universal time. The observations showed the total phase to begin at 14 hours 7 minutes 34.25 seconds, or slightly later than predicted. The third contact, the end of totality, was predicted for 14 hours 10 minutes 20.9 seconds, but observed at 14 hours 10 minutes 18.53 seconds, or nearly two and a half seconds early. The total observed duration of totality was thus two minutes 44.3 seconds, or some three seconds shorter than the calculated time of two minutes 47.3 seconds.

The position of the observing site used is given as longitude 79 degrees 51 minutes 23.42 seconds west; latitude 6 degrees 47 minutes 15.10 seconds south; altitude 28.57 meters.

ITEMS

THAT the war and its restriction on automobile driving have pushed falls into first place as cause of accidental deaths in the United States, is reported by the Metropolitan Life Insurance Company. Nosing out motor vehicles, falls in 1943 killed more than 25,000, which was about 2,000 in excess of the number killed by motor vehicles. The chief victims of fatal falls are old people. Whether because they fall more often or because when they do fall the results are more serious is not known, but more than two thirds of the deaths from falls happen among persons aged sixty-five years and older.

THAT the appendicitis death rate has been almost halved in the last four years, is also announced by the Metropolitan Life Insurance Company. The statement applies to the company's industrial policyholders but records of the Census Bureau quoted in the company's statement show that in all but five states the appendicitis mortality has been lowered by more than fifty per cent. in the years between 1930 and 1942. The reduction in appendicitis mortality, called an "outstanding public health achievement," is credited primarily to the intensive educational campaign to encourage early hospitalization in appendicitis and to discourage the use of laxatives in the presence of abdominal pain.

A NEW deficiency disease, marked by musclar stiffness and deposits of calcium phosphate in all organs and parts of the body, was described before the Cleveland meeting of the American Chemical Society by Professor William J. Van Wagendonk of the Oregon State College. The preventive dietary factor is present in cream, in very small quantities. Professor Van Wagendonk stated that he has isolated one milligram of it, and that he used up 550 gallons of cream for the purpose. It would take about 30,000 milligrams to make an ounce by weight. Pasteurization destroys it. The same factor has also been detected in green vegetables, especially cabbage. Guinea pigs kept on a diet containing skim milk but no cream developed the stiffness in two or three weeks, and the lime deposits in about a year. One tenth microgram of the preventive factor (which is a ketone) abated the stiffness in about five days, but it took a year for the lime deposits to be eliminated. The discovery of the lime deposit formation is credited to Professor Van Wagendonk's colleague, Professor Rosalind Wulzen.

A TELEVISION studio plan for the post-war period, with a revolving stage carrying four sets, which two audiences can watch by turns or simultaneously while the cameras shoot, was demonstrated on April 6 as a large working model before an audience of technical men and newspaper writers. The "unveiling" was done by Dr. Walter R. G. Baker, vice-president of General Electric Company. A circular revolving stage under a central dome-shaped roof is divided into quadrants, each bearing a complete stage, so that while one of the four is facing the cameras and the studio audience the other three can be undergoing dressing for scenes to follow, which can then be swung into place when ready. The auditorium is divided into three sectors. The center part is occupied by the cameras, which are set to take the scene on the stage from any range and all angles. Flanking this are the sectors occupied by the radio audience. Sound-proof curtains are so arranged that at the end of any scene either sector can be cut off from the stage, and the people may file out without disturbing the action; or both audience sectors may be used simultaneously if desired. Design for the new studio was worked out by architects of the firm of the Austin Company of Cleveland.

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SCIENCE NEWS

Science Service, Washington, D. C.

THE CHEMICAL TREATMENT OF WOOD

SOFT woods become harder than hard maple and maple wood is made harder than ebony by a new chemical process announced by Dr. J. F. T. Berliner, of the E. I. du Pont de Nemours and Company. It is a development by chemists of the company following a line of research that paralleled studies conducted by the Forest Products Laboratory of the U. S. Department of Agriculture.

This process makes timber markedly harder, stronger, stiffer and more durable, it is claimed. The natural tendency of wood to swell, shrink or warp with changes of humidity is eliminated. Furniture, for instance, made of the transmuted wood can be shipped throughout the world, to tropical jungles or arid deserts, and will remain in condition. Color may be imparted permanently throughout the material by the use of dyes in the impregnating material.

The chemical agent used in this new process is called methylolurea and is made by compounding urea with dimethylolurea. Both these materials are white, water-soluble solids, produced from ammonia, carbon dioxide and methanol, more commonly known as methyl alcohol. Urea results from the reaction of ammonia and carbon dioxide. Formaldehyde, derived from methanol, condenses with urea to form dimethylolurea. Both urea and dimethylolurea are inexpensive chemicals available commercially.

The methylolurea is impregnated into the wood in a water solution. It reacts with the components of wood to form hard, water-insoluble, unmeltable resins within the piece of timber being treated. Heat, such as kiln drying, speeds the process.

The treatment can be used also to harden the outside portion of a piece of lumber without affecting the interior, obtaining results somewhat similar to those obtained in case-hardening steel. This treatment will be found desirable for certain types of construction such as trestles, bridges and towers.

ITEMS

HWA LO-KENG, a self-taught Chinese mathematician, is coming to the United States to lecture at the invitation of Dr. Albert Einstein, professor in the Institute for Advanced Study at Princeton, N. J., according to reports to the Chinese News Service. Professor Einstein is starting a series of lectures on unsolved problems in mathematics by authorities from various parts of the world. Both he and Mr. Hwa will serve as directors of the program as well as lecturers. There will be a total of four such directors. A native of Kingtai in Kiangsu Province, Mr. Hwa is the author of eight dissertations in his field. His two published theses on much discussed but unsettled mathematical problems have aroused great interest among the mathematicians of the world.

QUARTZ filaments, so fine that it would take 60 of them to make the thickness of a human hair, are drawn out in production in a relatively new method by use of a bow and arrow at the Westinghouse Research Laboratories at Pittsburgh. These superfine filaments are for use in the electron microscope to measure or calibrate its magnifying power. The bow, made of tough flexible steel, is mounted on a wooden stock. The arrow is shot out along a groove in the stock. In action the cross-bow is placed in firing position and a small cylindrical piece of quartz attached to the rear end of the arrow. The quartz is heated by an oxy-hydrogen torch until it is just ready to melt. Then the arrow is released, trailing behind it threads of quartz sometimes 20 feet in length.

DR. GUSTAV EGLOFF and Mary Alexander, of the Universal Oil Products Company, reported at the Cleveland meeting of the American Chemical Society that when the motorist of the future talks of how much mileage he gets out of his "gas," he may be using the word literally rather than as a shorthand term for gasoline. Under the necessities of war, more than 165,000 automobiles, mostly in Germany, are using gaseous fuels. Even in this country, some 25,000 buses, trucks and other heavy-duty vehicles employ gases for fuel. All the automobiles in the United States could run, if necessary, on methane (marsh gas) obtained from natural gas, petroleum refining and coal processing.

PHOTOFLASH lamps are satisfactory for the illumination of films taken with high-speed motion picture cameras on continuous moving film at the rate of upward of 2,000 frames per second, Henry M. Lester, of New York City, reported at the recent meeting of the Society of Motion Picture Engineers. He accompanied his description of the methods employed with motion pictures and demonstrations. High-speed cameras are now in use, he said, that produce exposures of from 1/10,000 to 1/30,000 second. Such brief exposures call for illumination of great intensity and high color temperature. Incandescent lamps capable of providing such illumination, especially when operated at voltages higher than their respective rating, have many disadvantages, he stated. Among them are great power requirements, heavy conductors and the development of considerable heat. "Operating on the current of a 6-volt dry cell (Hot Shot) battery one or more photoflash lamps will provide ample light of high color temperature of easily controlled duration," he continued. "Successive flashing of any number of photoflash lamps is accomplished with a Flash Distributor of a simple design."

STANDARD specifications for leather aprons, leather cape sleeves and leather knee-length leggings have been approved by the American Standards Association and are available to those interested. They are the first three in a series of war standards for protective occupational clothing for factory and other industrial workers. These standards provide specifications for the different kinds of leather aprons, cape sleeves and leggings, which the committee considered necessary to adequately protect both men and women working in industrial plants from sparks, molten metal, infra-red and ultraviolet rays, and also from limited impact forces. They cover pattern, design, material and construction.

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SCIENCE NEWS

Science Service, Washington, D. C.

CHROMIUM

CHROMIUM in steel-making has a wider application than any other alloy material. It is an essential in most modern steels. It imparts hardness, wear resistance, useful magnetic properties, and increases resistance to corrosion. In the presence of carbon it combines with the carbon and forms a very hard carbide. Low-carbon chromium steels are casehardened to give greater resistance to wear and are used in ball and roller racers, gears, pins and shafts. High-carbon chromium steels are used in bearings, files and metal cutting tools. Razor blades, springs, balls for ball-bearings, permanent magnets, dies and protective plating are made from one or another type of chrome steel alloys.

Stainless steel manufacture is the largest and best-known use of chromium. Chromium is more valuable as an alloying element in steel when used in conjunction with nickel or vanadium. It is used also in conjunction with several others. Munitions, warships, tanks, trucks, tractors and other automotive equipment are all important war users of chromium.

Chromium plating is an important industrial use of this metal. Fields of application of chromium plating are in the manufacture of turbine blades, tubing, bolts and screws. Household plumbing fixtures are often chromium plated. Chromium chemicals are used in dyeing, tanning, and in pigments. Normal American uses are now much restricted because of the need for practically all available chromium in war equipment.

The United States mines relatively little domestic chromite but uses annually large quantities. In 1941 the consumption of all grades of chromite here amounted to nearly 715,000 long tons. The same year the domestic production was less than 13,000 long tons, the imports, nearly a million tons, making an apparent available supply of over 1,000,000 tons. The imports came from Cuba, the Philippines, India, Turkey, Brazil and from Southern Rhodesia and the Union of South Africa. Some chromite was obtained from South Pacific islands. Sufficient supplies seem still available even with shipping from some former sources cut off.

ITEMS

THE eye-saving role of penicillin appears in a report by Dr. G. T. Willoughby Cashell, squadron leader and ophthalmic specialist, R.A.F., to the *British Medical Journal*. He states that "It is possible to save eyes which would otherwise undoubtedly have been lost from intraocular infection." Inflamed, crusting, scaly lids with watery discharge, present in some cases since childhood, cleared up within two weeks or less when a drop of penicillin solution was put in each eye three times a day. Cases of acute conjunctivitis improved dramatically. Ulcers of the cornea and infections following perforating injury of the eyes responded equally well to penicillin treatment. In five out of six cases of such injury, spread of the infection to all structures and tissues of the eyes was avoided.

WET but warm is a possibility for any one exposed to rainy cold weather if dressed in a fabric with a high wool content and the fabric is constructed so that as little of it as possible is in touch with the skin. The National Bureau of Standards has concluded studies which not only confirm general experiences with wet clothing, but also emphasize the superiority of fabric construction that minimizes the area in contact with the body. In the tests, various wet wool fabrics were laid on an artificial skin surface, and measurements were made of the extent of contact and of the drop in temperature of the artificial skin. Fabrics that made good contact with the surface produced considerable chilling in the skin; those that made poor contact because of the roughness of the weave caused only a relatively small drop in the temperature. Fabrics with a high percentage of wool caused less drop in temperature than those with lower wool content.

NEWLY built modern homes, generally accepted as being completely insulated, are really not so. The vulnerable spot lies behind the radiator recessed in the outside wall. With adequate insulation of this area, as much as 7 per cent. of the winter fuel can be saved, is reported by engineers of the University of Illinois. A typical brick veneer small home erected by the Institute of Boiler and Radiator Manufacturers was used for the tests. Reports state that the heat loss for each square foot of uninsulated recess equals as much as that of 16 square feet of the insulated wall. By installing in each radiator recess a one-inch rigid insulation with an aluminum foil reflective surface facing the back of the radiator, this loss can be prevented. To avoid drafts, radiators should be placed on outside walls. In this way, the air from the colder surfaces of the room is warmed by the radiator, producing a gentle circulation of warmed air. When the radiators are on the inside walls, the cold air is drawn to them across the floor, creating undesirable drafts.

The "indiscriminate" use in industry of vaccines against the common cold is reported in the *Journal* of the American Medical Association by Dr. Lemuel C. McGee, of Wilmington, Del., Dr. J. E. Andes, of Morgantown, W. Va., Dr. C. A. Plume, of Succasunna, N. J., and Dr. S. H. Hinton, of Parlin, N. J., all of them connected with the medical department of the Hercules Powder Company. Three cold vaccines to be taken by mouth and two cold vaccines for hypodermic use were given during the October to April seasons of 1941–1942 and 1942–1943 to more than 1,000 industrial and office workers. Careful records were kept of the number of colds and the number of days lost from work because of colds in these groups and in other groups not receiving the vaccines. "No evidence of clearly effective prophylaxis against either the frequency or severity (including complications) of the common cold from the use of any of the vaccines studied" was found. It is pointed out that this experience confirms the findings of three other groups of medical scientists.

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SCIENCE NEWS

Science Service, Washington, D. C.

AERIAL TRANSPORT OF DISEASE

MUTUAL problems, from politics to pure food and drugs, that affect the health of all the people of the Americas were discussed at the Fifth Pan American Conference of National Directors of Health.

Dr. Hugh S. Cumming, retired Surgeon General of the U. S. Public Health Service and provisional president of the conference, pointed out that the spread of diseases from one country to another, always a problem, is made more acute by the war.

Increase in air travel between American countries has increased the hazards, because undetected infections such as yellow fever may be carried not only by passengers but by stowaway mosquitoes. Provisions of the International Sanitary Convention of 1933 for guarding against this danger may need to be changed to meet present conditions.

Surgeon General Thomas Parran, U. S. Public Health Service, pointed out that protection against unsafe food and drugs is a federal responsibility in the United States. The responsibility, however, does not extend to foods and drugs that are exported from this country. Extending this protection against adulterated or impure food and drugs and vaccines to people in all the Americas may require the strengthening of laws in each individual country, or some international agreement might be worked out in the future to meet this problem.

That political interference with national health services may be a problem in some of the American nations was indicated by Dr. J. Barros Barreta of Brazil.

Even animal diseases present a problem for national health officials, since some of these diseases may spread to man. Prevention of their spread between countries is also a matter to be worked out by international cooperation.—JANE STAFFORD.

ITEMS

TWO new electron microscopes were exhibited for the first time at the meeting in New York City, on May 3, of the Society of American Bacteriologists by the Radio Corporation of America in whose laboratories they were developed. One is an advanced and improved model of the instrument introduced in 1940, the other is in a compact console form, the first of its kind to be developed. This new compact instrument, it is expected, will have wide use in smaller industrial laboratories, hospitals, schools and other institutions which, because of limited funds or space, are not able to install the larger and more powerful microscope. The instrument was described and demonstrated by representatives of the makers, and important electron micrographs of bacteria and viruses were shown. Dr. V. K. Zworykin, of the Radio Corporation of America, developed America's first electron microscope. The first commercial instrument was constructed in 1940.

HOPE that serum treatment for nervous system diseases caused by viruses, such as infantile paralysis, might become effective appeared in studies reported at the New York meeting of the society by Dr. Charles A. Evans, of the University of Minnesota, and Dr. Howard B. Slavin and Dr. George P. Berry, of the University of Rochester. Failure of serum treatment against infantile paralysis in the past has been explained as due to the blood-brain barrier. The antibodies which might fight the virus may develop or be injected into the blood but are ineffective because they can not pass this barrier to get at the virus in the brain and nervous system. Working with a different kind of virus, the herpetic virus that attacks the nervous system of mice, it was found that anti-herpetic serum did retard the progress of the virus through the nervous system and in some cases arrested it altogether.

ONE-POUND hydrogen generators now furnish the lifting power needed to float into the sub-stratosphere weather-recording balloons used by the Army Signal Corps to chart the weather accurately. Inflation of these balloons under difficult conditions at the front lines has been made possible by an ingeniously contrived device, the hydrogen generator container, designed in the laboratory of the war products division of the American Can Company in collaboration with Signal Corps officers. Adaptable to almost instant use in any field of action where water is available, this generator replaces the former hydrogen tank which, because of its weight and bulk, required trucking. A companion device to the generator is a new battery can which makes it possible automatically to fill the batteries with acid by packing them in a vacuum, just as foods are packed for safe-keeping. When the can is punctured, acid is drawn by the vacuum into eighteen tiny holes in the battery which is held clear of the sides of the can by fluted partitions.

FIBROUS plastics, in which the long, tough strands of the natural vegetable material reinforce the final product, have come to play an enormous role in the industry, according to W. E. Parsons, vice-president and general manager of the Keyes Fibre Company of Waterville, Maine, who spoke at the tenth annual Chemurgic Conference. More than half of the approximately 275,000,000 pounds of rigid plastics of all types contained fibers as fillers, strengthening agents or for other purposes. One interesting new group of products in this class described by the speaker starts with a mat of sisal or hemp fibers. These are treated with phenolic resin, cut into rough shapes known as preforms, and cured under pressure and heat in the customary molds or dies. One fibrous material which Mr. Parsons considers promising is lignin, the chemically stubborn stuff left over after cellulose has been extracted from wood. At present mainly a troublesome waste and a "headacher" to pulp producers, lignin may presently become either a valuable filler and reinforcing material for embedding in plastics, or chemical means may be found to convert it into a high-quality, low-cost plastic itself.

WILEY

NEW WILEY BOOKS

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By HERVEY W. SHIMER, *Professor Emeritus of Paleontology*, and ROBERT R. SHROCK, *Associate Professor of Geology; both at Massachusetts Institute of Technology.*

Replacing the original Grabau and Shimer's "North American Index Fossils," this is a reference work for lecture and laboratory study in advanced courses in invertebrate paleontology. It will also be of value for various theses investigations in paleontology and stratigraphy. No comparable book exists: There are over 8,000 individual illustrations; approximately 7,500 species are described and figured. Specialists in nearly all the larger divisions have either revised the material in the book or have assisted the authors in doing so. *A Massachusetts Institute of Technology Press Book. Ready in May.*

837 pages; 7½ by 10¾; $20.00

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Like Volume I (1942, $4.00), this volume presents, from the preparative viewpoint, critical discussions of widely-used organic reactions. It covers: The Claisen rearrangement; the preparation of aliphatic fluorine compounds; the Cannizzaro reaction; the formation of cyclic ketones by intramolecular acylation; reduction with aluminum alkoxides (the Meerwein-Ponndorf-Verley reduction); the preparation of unsymmetrical biaryls by the diazo reaction and the nitrosoacetylamine reaction; replacement of the aromatic primary amino group by hydrogen; periodic acid oxidation; the resolution of alcohols; and the preparation of aromatic arsonic and arsinic acids by the Bart, Bechamp, and Rosenmund reactions.

461 pages; 6 by 9; $4.50

A NEW MANUAL FOR THE BIOLOGY LABORATORY

By BERNAL R. WEIMER, *Dean of the Faculty and Professor of Biology, Bethany College, West Virginia*, and EARL L. CORE, *Professor of Botany, West Virginia University.*

Carefully selected exercises illustrating the general principles of biology. It is intended to accompany the textbooks "General Biology" and "Elements of Biology" by Strausbaugh and Weimer, or any other general textbook in biology. Special care has been used in the selection of specimens for study, and of the large number of questions scattered throughout the manual. The inclusion of numerous demonstrations and optional exercises adds flexibility to the manual and makes it adaptable to a variety of courses. Sheets of prepared drawings, as well as sheets for drawing by students, are included at the back of the book. *Ready in May.*

Approx. 214 pages; 8½ by 11; Probable price, $2.00

JOHN WILEY & SONS, Inc., 440-4th Ave., New York 16, N. Y.

SCIENCE NEWS

Science Service, Washington, D. C.

THE SYNTHESIS OF QUININE

FOR the first time in history quinine, important malaria remedy found in the bark of the cinchona tree, has been put together in the laboratory. This total synthesis of quinine has been accomplished by Dr. Robert B. Woodward, of Harvard University, and Dr. William E. Doering, of Columbia University, working for the Polaroid Corporation. The details of the method are published in the *Journal of the American Chemical Society*.

This chemical feat may point the way to another important achievement, the development of a better anti-malarial than quinine itself or the synthetic chemical, atabrine, now also widely used in malaria treatment. Although both quinine and atabrine are effective in treating malaria, neither of them is a true prophylactic. This is because neither attacks the malaria germ in its earliest, pre-infective stage as injected by the mosquito. Nor is either of them very effective in preventing relapses. The Woodward-Doering process for synthesizing quinine has already led to synthesis of another entirely new substance, an optical isomer of quinine. The structure of this substance looks like the reflection in a mirror of the quinine molecule. Tests to determine whether it has value as a remedy are planned.

The synthesis started with a coal-tar derivative, 7-hydroxyisoquinoline, and proceeded through nearly a score of chemical processes until success was attained. This chemical had originally been produced from quinine by Pasteur and in 1918 a German chemist, Rabe, had reconverted it into quinine.

Whether the laboratory synthesis can be made commercially practicable has not yet been determined. The Polaroid Corporation does not intend, according to Edwin H. Land, president and director of research, to manufacture the products involved, but to license the process after consultation with government authorities to such organizations as are best fitted to assure the broadest usefulness for the discovery.

Commercial production of synthetic quinine might be pushed if we did not have enough atabrine and totaquine for military and essential civilian needs. Totaquine is a mixture of chemicals from cinchona bark and contains quinine.

When the Japanese seized Java in March, 1942, they also gained almost the entire world's supply of quinine. Cinchona trees, however, are native to South America, where the anti-malarial action of their bark was first discovered. Since the war steps have been taken to reestablish these cinchona plantations. Our supplies of totaquine are coming now from Latin American countries.

ITEMS

VIRUSES, the cause of many diseases including the common cold and infantile paralysis, are not living organisms like other disease germs but complicated protein chemicals, inanimate in nature, in the opinion of Professor Roger J. Williams, director of the Biochemical Institute of the University of Texas. The reason for his opinion is based on findings at the Clayton Foundation, showing that viruses apparently do not contain any B vitamins. Professor Williams states in a report for the *Journal of the American Chemical Society* that appreciable amounts of the various B vitamins have, however, been found in all forms of living matter which have been investigated. The presence or absence of these vitamins, he suggests, may be used as a criterion of the living or non-living nature or origin of a material in question.

PROTECTION of our fighting men against diseases, in past wars even deadlier than enemy bullets and shellfire, has been greatly improved since World War I, was stated by Dr. R. E. Dyer, director of the National Institute of Health at the recent meeting of the American Philosophical Society. Especially great advances in the field of immunization have been made against typhoid, tetanus, typhus and yellow fever. There was an effective vaccine against typhoid in the last war, but the one we have now has far higher potency. A new method of developing active immunity against tetanus has been discovered and is used for the protection of all troops. Typhus and yellow fever are not universal perils, but menaces in particular zones. Troops being sent to duty in such areas are being given protection against these diseases.

No airplane engine suitable for the post-war private market is now available, according to J. H. Geisse, of the U. S. Civil Aeronautics Administration, who spoke at the meeting in Detroit of the Institute of Aeronautical Sciences. It is necessary that either engine design be so simplified that engines can be produced cheaply in relatively small quantities or they must be produced in quantities exceeding any probable demand for personal airplane use. Research work is needed in the development of a suitable power plant and he emphasized that it should certainly include work on two-cycle engines because of their simplicity. It would be a boon to private flying, he added, if such research developed an engine that would have increased power without greater fuel consumption.

TEXAS cantaloupes, due to reach the market very soon, should become more abundant from now on, because a new variety has been developed that is resistant to both aphids and downy mildew, the worst insect enemy and the worst fungus pest of cantaloupe vines everywhere. Breeding work on the new variety was carried out by Dr. S. S. Ivanoff, of the Texas Agricultural Experiment Station, who discusses it in detail in the *Journal of Heredity*. Breeding stocks were selected from four varieties of West Indian origin, all of which had shown resistance to aphids and mildew under South Texas conditions. Good size and shape for market requirements, ability to stand up under shipping conditions, and desirable qualities of sweetness and flavor were developed during the breeding program.

WILEY

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By RALPH S. BATES, *formerly of the History Department, Massachusetts Institute of Technology.*

This is the only book to give a full-scale account of the evolution of American scientific organizations. Here is the story, covering two and one-half centuries, of these societies—local, state, and national, as well as those in the specialized branches, ranging from astronomy to zoology. Of particular interest today is the picture which the book gives of the mobilization of American science for the war effort. It shows not only how it was done in the first World War, but how it has been accomplished in the present conflict. *A Massachusetts Institute of Technology Press book. Ready in July.*

Approx. 264 pages; 5½ by 8⅜; Probable price, $3.50

JOHN WILEY & SONS, INC. 440-4th Ave. New York 16, N. Y.

SCIENCE NEWS

Science Service, Washington, D. C.

THE PRODUCTION OF PENICILLIN

A PRECEDENT in United States-Mexican relations that may have far-reaching good results has been set with the establishment in Mexico of the Wyeth-Stille Laboratories for the production of penicillin.

News of this laboratory, which was established in April and by the end of this month is expected to be producing 10,000,000 units of life-saving penicillin a day, was brought to this country by Dr. Jose Zozaya, director of the Mexican Institute of Public Health and Tropical Diseases, a member of the Mexican Advisory Council to Science Service. Dr. Zozaya is also chairman of the Committee of Penicillin Control established in Mexico by presidential decree. It was his idea to get an American drug manufacturing firm to join with a similar firm in Mexico for penicillin production.

The Mexican part of the new penicillin production plant, Stille Laboratories, is one hundred per cent. Mexican. Wyeth, Inc., of Philadelphia, instead of establishing a laboratory or branch of its own, has joined with the Mexican firm to establish a new laboratory and is sending technical men to train Mexicans in penicillin production methods. The latter will work under Dr. Zozaya's direction. This is the first time such an arrangement has been worked out.

Thanks are especially due the American Embassy in Mexico which, according to Dr. Zozaya, "has broken a million barriers in getting this accomplished."

Many lives will be saved in the coming months as a result of its efforts and those of other agencies in getting the penicillin production plant started at once instead of six months from now.

Dr. Zozaya is in this country now to discuss with Army and Public Health Service authorities and professors in medical schools a plan he has for making the facilities of his institute available to American students of tropical diseases. The institute has not only a laboratory for research in tropical diseases but a fifty-bed hospital and branches in other parts of Mexico where young physicians can see and study patients suffering from diseases that war may spread far beyond the tropics as soldiers and European refugees return to their homes.

Typhus fever, brucellosis or undulant fever, malaria, fungus diseases, and intestinal infections are among the diseases of which the institute can furnish abundant material for study. Dr. Zozaya hopes that the institute may have as guests, for six months or so each, medical scientists planning to specialize in the investigation as well as in the treatment of tropical diseases.—JANE STAFFORD.

ITEMS

THE average length of life of the American people reached a peak of 64.82 years, the highest on record to date, in 1942, according to statisticians of the Metropolitan Life Insurance Company. The average girl baby who celebrated her first birthday that year can expect to live longer than the proverbial threescore years and ten. She can expect to live till she is 71 years. Almost two years over the average expectation of life at birth is gained by surviving the first, dangerous year of life, and more is gained by being a girl. Among white males, the average age at death will be over seventy years only for those who have reached their fortieth birthday. The longevity record established in 1942 probably will not be equalled in 1943 or 1944 because of the war. "A very large proportion of those now at work will live to the usual retirement age. Age sixty-five will be attained by more than two thirds of those now between twenty-five and thirty-five, by almost three quarters of those now forty-five, and by four fifths of those fifty-five years old. The number of years remaining after sixty-five is quite appreciable; for the average person it is 13.12 years, while for those in a state of health better than average the outlook is even more favorable."

SOME of the B vitamins may help to make promin a better medicine for tuberculosis, it appears from studies reported by Dr. G. M. Higgins, of the Mayo Clinic. When this relative of the sulfa drugs is given by mouth to growing white rats it exerts a rather severe toxic effect. Over-irritability, occasional paralysis, some loss of appetite, cyanosis and anemia are among the changes in these animals following doses of promin. The animals lost weight and gradually lost their hair. When, however, the promin-treated animals were allowed to partake freely of B vitamins as they desired, their intakes of thiamin, riboflavin and pyridoxine greatly increased, sometimes sixfold over the amounts considered essential for normal nutrition. While taking these extra amounts of the vitamins, they did not show signs of the toxic effects of promin. There were no signs of irritability, they did not grow bald, nor did they lose their appetites or any weight. Signs of cyanosis were far less marked and the anemic condition improved.

MEN in the dire need of water that comes when adrift on a raft at sea can, surprisingly enough, meet part of their requirements through eating glucose, according to a report made by Professor James L. Gamble, of Harvard Medical School, to the meeting of the American Philosophical Society. He said: "It turns out that a part of the water requirement found for fasting can be replaced by glucose, and all of the physiological benefits of glucose can be gained, at no cost to the water exchange." Hydrogen and oxygen are present in glucose, as well as in other carbohydrates, in the same two-to-one proportion that represents water, but with the addition of half-a-dozen carbon atoms per molecule. The rearrangement by which the body is able to make use of these elements is physiologically complex, but the living mechanism of human cells can do it if the need is great enough.

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SCIENCE NEWS

Science Service, Washington, D. C.

A PREVENTIVE OF MEASLES

THE War Department announces that it has on hand large supplies of a new, effective measles preventive that can be given soldiers exposed to the disease. The preventive is known scientifically as gamma globulin. It is being obtained from plasma from the blood collected by the Red Cross for the armed services.

Research by Dr. Edwin J. Cohn, of the Harvard Medical School, led to the development of this measles preventive. Dr. Cohn has succeeded in separating from blood plasma by chemical means various components or fractions. One such fraction is fibrin foam, now being used to stop bleeding in surgical operations. Another is the gamma globulin, which contains the antibodies developed in the blood to fight an invasion of measles germs. Presence of these antibodies developed in the blood during an attack of measles explains why as a rule no second attack occurs.

Since most grown-ups have had measles, the blood they donate to the Red Cross contains these antibodies and also antibodies against other diseases to which they may have built up immunity.

Measles has so far been a very slight problem in the Army, with a very low occurrence rate compared with that of the last war, when at one Army camp alone hundreds of new cases developed day after day and every arriving troop train had from one to six cases in the eruptive, very infectious stage.

Memory of these thousands of soldiers who had measles, many of them dying from the pneumonia that followed, led to establishment in 1940 of a Commission on Measles and Mumps under the direction of Dr. Joseph Stokes, Jr., of the Medical School of the University of Pennsylvania.

This commission and nine others making up the Board for the Investigation and Control of Influenza and Other Epidemic Diseases in the Army, with Dr. Francis G. Blake as president, function under the direction of the Preventive Medicine Service of the Office of the Surgeon General.

For over a year members of the Commission on Measles have studied the new measles preventive. Most of the work, according to the announcement of the War Department, was done at Army camps, but a significant study was carried out during an outbreak of measles at an eastern girls' college. Among 67 students given the globulin, only one developed an average case of measles, while 18 out of 38 not given the globulin developed average measles.

ITEMS

CITRUS fruit juice may be concentrated to about one fourth of its normal volume to save space in storage and shipping by a new method developed by Dr. A. L. Stahl at the Agricultural Experiment Station of the University of Florida. Adding three quarts of water to one quart of the concentrate, will give a gallon of normal juice. The juices of mature fruit are extracted by reaming, then placed in a constant freezer and frozen to a slush consistency. The water in the juice freezes, while the minerals and other dissolved solids and other valuable parts remain in a semi-liquid state. The partly frozen mixture is then placed in a centrifuge revolving at moderate speed. The action separates the juice from the icy part of the slush. The process is still in an experimental stage. A pilot plant is to be set up by the State Citrus Commission and the college station to develop commercial production methods.

A METHOD of producing isoprene, the basic building block of natural rubber and important ingredient of synthetic rubber, was described at the Chicago meeting of the American Institute of Chemical Engineers by J. M. Mavity and E. E. Zetterholm of the Universal Oil Products Company of Chicago. Heretofore the isoprene needed for commercial use has been derived from turpentine, but when the new process is put into action the oil wells of the nation will supplant the pine trees, saving valuable turpentine for other vital uses. By the new process isoprene will be formed from readily available petroleum hydrocarbons by chemical methods, in one simple operation. The authors stated that isoprene will play a far more important part in the synthetic rubber field in the future.

A NEW type of fuel tablet has been developed by the Quartermaster Corps, U. S. Army, in collaboration with the Office of Scientific Research and Development. This fuel tablet will enable the soldier in the field to prepare a quick, hot meal from the "C" or "K" combat rations. The new tablet is a synthetic compound, known as trioxane, colored to distinguish it as non-edible. It has several advantages over the previously developed square paraffin candle. The new fuel tablet heats faster, is lighter in weight, is more compact and has a less luminous flame. The tablet is flat, weighs a little more than one ounce, and will heat a can of English style stew ("C" ration) in six or seven minutes.

THAT chlorine dioxide, a bleach known to be two and a half times as powerful as chlorine, is now available for industrial use by means of a process developed at the Mathieson Alkali Works was reported by E. R. Woodward at the Cleveland meeting of the American Institute of Chemical Engineers. Up to the present time, the industrial use of chlorine dioxide has been impracticable because it does not keep. The new process, described by Mr. Woodward, overcomes the difficulty by providing a simple process by which the user can prepare the strong bleach in any quantity right at his plant, from chlorine and sodium chlorite. Chlorine dioxide has already proved to be of specific value in the food, starch, soap, paper and textile industries.

Anatomy

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1155 Illus., Mostly in Colors. 1641 Pages. $12.00 (1942)

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Functional Neuroanatomy

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274 Illus. 553 Pages. $6.50 (1942)

• BREMER—WEATHERFORD'

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Letters from teachers regarding the new edition:

"The impressive quality of this book is its clarity and simplicity of style in which both Bremer and Weatherford have achieved an outstanding success . . . we are particularly pleased by the treatment of histology from the developmental point of view . . . the inclusion of the sections on the shapes of cells by Dr. Lewis and on the placenta by Dr. Wislocki is excellent . . . the many new illustrations greatly improve the text, in fact, all the illustrations have unusual teaching value."

598 Illus. 723 Pages. $7.00 (1944)

THE BLAKISTON COMPANY, Philadelphia 5, Pa.

SCIENCE NEWS

Science Service, Washington, D. C.

THE CYCLOTRON OF THE CARNEGIE INSTITUTION

SCIENCE has a new tool with which to probe the mysteries of the atom. It is the new giant cyclotron, or atom-smasher, just put into operation at the Department of Terrestrial Magnetism of the Carnegie Institution of Washington. The new cyclotron, one of the two largest in operation in the world, the other being at Berkeley, Calif., generates atom-smashing projectiles of 15,000,000 electron volts energy, permitting the most precise measurements ever made of the forces released by atomic disintegration.

The cyclotron itself weighs more than 225 tons, has an overall height of 12 feet, is 30 feet long and 20 feet wide. It took four years to build, at a total cost of $500,000 for the cyclotron, its appurtenances, and the special three-story building housing the equipment and instrument shop.

The magnet is made up of four iron castings, the largest weighing more than 50 tons. Surrounded by this heavy magnet is the accelerating chamber, about 60 inches in diameter, in which atomic particles are produced. In this accelerating chamber, the atomic particles receive successive "kicks" which cause them to whirl around in continually widening circles at tremendous speeds, until finally they reach a window on the side of the chamber, where scientists place any element they wish to bombard. Here the element receives the full force of the atom-smashing beam of atomic particles.

The Carnegie cyclotron is housed ten feet beneath the earth's surface, to prevent the radiation from reaching people outside. Mice, exposed to cyclotron radiations, of much less intensity than those created by the new atom-smasher, died in a few hours.

The new cyclotron, patterned along the same lines as 20 other similar instruments in the United States, is operated by Dean B. Cowie, physicist in charge. He sits at the control board, a huge organ-like console, many yards away from the cyclotron itself, and protected from its radiations by specially constructed insulating walls. Before him are seven main switches, over 100 smaller switches, and a maze of dials and meters. Only by pressing the right switches, in the right order, can he make the cyclotron operate. This interlocking system of controlled operation protects the equipment from accidentally being damaged by mistakes in operation, or by failure of any component of the cyclotron. Because of the dangerous radiations, and the high-voltage equipment in the cyclotron laboratory, no one ever sees the cyclotron in operation. To prevent accidents, should anyone be in the laboratory while the power is on, master switches on doors leading to the powerful high-voltage parts of the laboratory automatically cut off all power when these doors are opened.

The Carnegie cyclotron, with its 100 kilowatt radio frequency supply, operates at a frequency of 10 megacycles which changes the polarity of the electrodes 10 million times a second.

The cyclotron was the invention of Professor E. O. Lawrence, of the University of California, who received the Nobel Prize for its development. At the present time he is working on the most powerful cyclotron in the world, more than three times greater than the present 60-inch instrument. Dr. M. A. Tuve, Dr. L. R. Hafstad, Dr. R. B. Roberts, Dr. G. K. Green and Dr. P. A. Abelson, of the Department of Terrestrial Magnetism, integrated past experiences at other laboratories in this country, with improvements. With the beginning of the war, all these men were assigned to other, more immediately urgent war developments and since then Mr. Cowie has carried the responsibility of completion of the cyclotron.

ITEMS

INCREASED use of mineral oil may have serious nutritional consequences. Non-rationed mineral oil robs the body of at least two of the fat-soluble vitamins, and of calcium and phosphorus, according to the U. S. Department of Agriculture. Mineral oil, which has been plentiful and relatively cheap as well as not becoming rancid, has been used in increasing amounts in salad dressings and in such foods as salted nuts, potato chips and doughnuts. Its prolonged use, however, may lead to deficiency ills because it prevents the body from making full use of some of the most important essentials in food. Recent studies at the Arizona Station showed that mineral oil not only cheated the user of vitamin A, but also of vitamin D, the "sunshine vitamin," and calcium and phosphorus. Rats taking mineral oil needed three times as much cod liver oil to supply vitamin D as those not given the oil. Puppies fed mineral oil could not use the calcium and phosphorus in their food to build normal bones.

SULFADIAZINE given prophylactically to members of the armed forces to protect them from meningitis in case of a threatened epidemic will not affect their ability to pilot an airplane, drive a jeep or perform other tasks requiring hand-eye coordination and swift reaction, it appears from studies reported in the *Journal* of the American Medical Association. The studies were made by Dr. Alison H. Price, of Jefferson Medical College and Hospital, Philadelphia, and John C. Pedulla, safety examiner for the Pennsylvania State Police. Sulfadiazine in amounts usually considered adequate for treatment or prevention of certain infections was given to ninety healthy young men medical students. Eye-hand coordination and reaction time before and after the sulfadiazine were tested on apparatus used to determine the fitness of automobile drivers. The same tests were given to forty-four students who did not receive any sulfadiazine and who served as controls. No significant difference was found between the controls and the men taking sulfadiazine. What effects there might have been if the men had been suffering from an infection in addition to receiving the drug was, however, not learned from the tests.

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SCIENCE NEWS

Science Service, Washington, D. C.

THE EARTH'S MAGNETIC FIELD AND LONG-RANGE FORECASTS OF THE WEATHER

THAT long-range weather forecasts based on fluctuations in ultraviolet radiations received from the sun can obtain great help from a century's accumulated records of changes in the earth's magnetic field, was suggested by Dr. H. B. Maris, of the U. S. Naval Research Laboratory, at the meeting of the American Geophysical Union.

Calling attention to the pioneer work in correlating solar radiation changes with cycles in the earth's weather carried on by Dr. Charles G. Abbot, secretary of the Smithsonian Institution, Dr. Maris pointed out that the earth's magnetic field affords an instant and sensitive index to any change in ultraviolet radiation coming to us from the sun.

The great mass of earth-magnetic records show many persistent cyclic changes and these represent world-wide changes as contrasted with weather records, which usually represent local conditions. There is thus available to the weather forecaster, in the magnetic records, a vast store of information about solar radiations which probably can not be equalled by direct radiation measurements in 50 years.

An analysis of the magnetic records has led Dr. Maris to certain general conclusions, which, he cheerfully admitted, "are probably wrong." However, he challenged, "any one who proves them wrong must produce evidence to support a better guess."

One seventh of all magnetic fluctuations he considers due to gases from the tails of comets, swept up out of space by the earth as it swings across the cometary orbits. The relation of these orbital magnetic disturbances to weather, he said, should be quite different from that of the solar disturbances which are caused by ultraviolet radiations.

The remaining six sevenths of terrestrial magnetic disturbances Dr. Maris considers due to fluctuations in ultraviolet radiations originating on the sun. Dominating these cycles of ultraviolet changes, he stated, are three great eruptive solar disturbances—veritable giant fiery geysers—that have persisted on the sun throughout the past century. Study of the records of these, especially during the past forty-four-year period, has convinced Dr. Maris that their periodicities have had close correlations with weather cycles on the earth.

ITEMS

PLENTY of moisture in the soil to insure a big food crop—more than plenty in some places—is the encouraging report of the state of the nation as a whole summarized out of hundreds of individual observers' dispatches at the U. S. Weather Bureau. The corn crop, though late in getting planted, is as good as "made" even before the seed go into the ground. The one troubling exception is a strip of drought along the Atlantic seaboard, covering most of New England and running from New Jersey to Georgia. A drought area in the Southwest has been given at least a good dampening-down during the past week. A wide zone covering a large part of the prairie area west of the Mississippi continues rather too wet. The wettest spot is in central Iowa, where the Des Moines river and its two principal tributaries, the Raccoon and Skunk Rivers, are still above all flood marks since 1903. The sogginess rises to a second climax near the Gulf, where eastern Texas reports fields exceedingly muddy, and where Louisiana cotton farmers are still unable to get their planting done.

A NEW contagious disease with symptoms so mild the sickness may go unnoticed is reported by Dr. Carl H. Smith, of Cornell University Medical College and the New York Hospital, in the forthcoming issue of the *Journal of the American Medical Association*. The chief feature of the disease is an increase in the lymphocytes, one of the kinds of white cells in the blood. Although the number of white cells may be increased almost tenfold, the lymphocytes are not abnormal or atypical. Fever and vomiting, pain in the back of the head and neck, or pain in the abdomen suggestive of appendicitis may occur in this new disease, but when they do, these symptoms last only a few days. In one case Dr. Smith reports, the child had fever, vomiting and abdominal pain, but a brother and sister had only symptoms of a mild cold. Only since 1939 have cases of this disease, called acute infectious lymphocytosis, been reported. The cause has not been identified but is believed to be a virus. The disease apparently attacks young children chiefly and they all seem to recover.

A NEW concrete wind tunnel has been put into operation at the Edmund T. Allen Memorial Aeronautical Laboratory, of the Boeing Aircraft Company, at Seattle. The 18,000 horsepower electric motor, built by Westinghouse Electric and Manufacturing Company, is capable of generating super-hurricanes in the 700 miles-an-hour range, about five times the force of an average hurricane. In this wind tunnel, the largest operated by any private aircraft manufacturer, Boeing engineers will test the behavior of planes, wing shapes, and other parts or sections of aircraft at speeds approaching the speed of sound, around 750 miles an hour. The need for a wind tunnel producing high speeds became evident when it was discovered that the aerodynamic rules that hold good at present speeds may not apply to the planes of the future. It is believed that present-day aircraft at their moderate speeds affect the air ahead of them in such a way that the air can readily flow about their wings and bodies. The airplanes of the future are expected to cruise at speeds from 600 to 800 miles an hour, and a different type of airflow will occur at these higher speeds.

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SCIENCE NEWS

Science Service, Washington, D. C.

A NEW STAR CAMERA

A NEW sky camera that enables engineers, surveyors, and astronomers to determine their location, by photographing the night sky directly overhead, was reported at the Washington meeting of the American Geophysical Union by Lt. Julius L. Speert, of the U. S. Army Air Corps.

The new camera takes a standard 4 by 5 inch plate and is set on a tripod so that it photographs a portion of the sky directly above, showing the stars in the vicinity of the zenith. Attached to this camera is another smaller camera, usually 35 millimeter size, which takes a picture of a clock at the same instant as the photograph of the stars is taken. With this information, the sky-photographer can determine his exact location.

To simplify the problem of identifying the stars photographed, a special light box has been developed. The light box contains a glass window which is illuminated from behind. Directly back of the glass plate there is a long strip of thin film mounted on two spools. On the film is drawn a special diagram covering the full region from the equator to the pole, and to the same scale as the photographic plates.

With the star photograph, and the time it was exposed known, and the approximate longitude of the point at which the exposure was taken also known, it is possible to determine the exact latitude within one or two seconds, by placing the photograph on the glass window of the light box and moving the film into the proper position.

With these data the stars may be quickly identified by referring to any competent star map or catalogue of stars.

ITEMS

A FAINT comet was discovered on May 16 by Dr. H. van Gent, of the Union Observatory at Johannesburg, South Africa. Located in the constellation of Vela, it was of the twelfth magnitude. Moving northward, the comet may eventually become high enough above the southern horizon for northern observatories to sight it. Further observations must be made, however, before it can be determined whether the diffuse-appearing comet is increasing or decreasing in brightness. At present it is far too faint to be observed by amateur astronomers. The position of the comet on May 23, as cabled to Harvard Observatory, astronomical clearing house for the United States, was at right ascension 9 hours 25 minutes, and declination minus 49 degrees 20 minutes. It was moving northward at a rate of about 42 minutes per day, and eastward with a speed of 2 minutes 36 seconds. Dr. van Gent also discovered a ninth magnitude comet last November.

PAIN and the dry socket condition that plague patients and dentists after a tooth has been pulled are often due to the patient's being undernourished and below par physically, Dr. Vernor H. Eman, dental surgeon of Grand Rapids, Mich., reports in the *Journal of Oral Surgery*, published by the American Dental Association. "The majority of patients for extraction are taken, we might say, literally 'off the street,'" Dr. Eman states. "They come in because they have a toothache or because, for some reason or other, and possibly without the advice of a physician, they have decided that certain teeth should be removed. A satisfactory and complete evaluation of the patient's physical condition is, under such circumstances, hardly possible. An undernourished patient is a poor risk for any operation, and that applies quite as definitely to minor as to major surgery. Undernourishment may be present, of course, for reasons other than deficiencies of diet, but the most impressive of all cases have been the dietary deficiency cases."

ONE out of every ten eye accidents can be blamed on attempts of amateurs to remove a particle lodged in the eye. More than half of the people forced to wear artificial eyes were victims of accidents, it was revealed in a survey on artificial eye wearers recently completed in nine major cities by Paul Gougelman, artificial eye manufacturer, in cooperation with the Greater Chicago Safety Council. Flying chips of wood caused 15 per cent. of all eye injuries. Falls around the home, and careless use of scissors, wire, nails and hammers accounted for a large number. On-the-job accidents, where pieces of steel entered the eyeball, accounted for one out of every seven eye injuries. The number of eye accidents in industry, however, is sharply decreasing with the use of modern safety devices such as goggles, safety masks and helmets.

A NEW heat-resistant plastic that can withstand boiling, and dry heat as high, has been announced by the Monstanto Chemical Company. Developed by Dr. Reid Fordyce and Dr. David T. Mowry, the new plastic has already found wide use in war work, particularly radar, radio and other military electronic equipment where materials of lightweight, suitable electric and great heat-resistant properties are needed. It is also being used for surgical instruments, since it can be sterilized. Dr. Charles Allen Thomas, director of Monsanto central research laboratories, describes the new plastic as "a thermoplastic, readily moldable in standard molding machines, and combining high resistance to heat with resistance to strong, corrosive chemicals, excellent electrical insulating properties, and high rigidity and strength." The new thermoplastic is a synthetic co-polymer containing carbon, hydrogen and nitrogen. Officers of the Monsanto Chemical Company are withholding any additional information about the new plastic, including its exact chemical composition, pending action on patents. The plastic has been given the commercial name Cerex. After the war, a wide range of civilian applications are possible, wherever heat-resistant qualities are in demand, such as dishes and utensils that are subjected to boiling water in washing.

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SCIENCE NEWS

Science Service, Washington, D. C.

PROTECTION FROM MEASLES

PROTECTION from measles will be available to children, and grown-ups too if necessary, through a by-product of blood donated to the Red Cross for the nation's fighting men. The protection will be given by a substance called gamma globulin, separated from blood plasma by Dr. Edwin J. Cohn, of Harvard University. The globulin can be used either to prevent measles or to modify the attack so the patient is not very sick but develops resistance to further attack. The American Red Cross, functioning as coordinator, will assist in transferring the measles preventive from the manufacturers to state and local health departments. These will pay the cost price and distribute the material without charge.

Announcement of this latest development of the blood donation program comes from the Navy Department with a detailed progress report by Vice-Admiral Ross T. McIntire, Surgeon General of the U. S. Navy.

Fully a year before Pearl Harbor the Navy's Bureau of Medicine and Surgery began the project which has yielded gamma globulin for the prevention or modification of measles; concentrated serum albumin for saving lives threatened by shock from battle wounds; fibrin film and fibrin foam which are proving valuable in surgery of battle wounds, especially brain surgery; and blood grouping globulins essential in blood typing procedures before transfusions.

First aim of the program was to develop a concentrated protein for treatment of shock that would be lighter in weight and less bulky than blood plasma. The mobile nature of Naval and Marine operations and the need to conserve space in all types of ships, planes and land vehicles, dictated this need. It was filled when, in 1940, Dr. Cohn perfected a process for separating the protein fractions of blood plasma, and Captain Lloyd R. Newhouser, of the Navy Medical Corps, developed a satisfactory dispensing package for the albumin which was to replace plasma in many cases.

When, after months of painstaking tests of the albumin as a shock-reliever, the Navy finally let contracts to manufacturers for processing it, a foresighted clause was included directing them to store at low temperatures the plasma fractions which remained after the albumin was removed. Various by-products of albumin processing were then available when their usefulness was established.

Cooperating with the Navy in the program which has developed these valuable products for Navy, Army and, now, civilian use, are the National Research Council and the Committee on Medical Research of the Office of Scientific Research and Development.

ITEMS

STRANGE long-distance bursts causing interference in high frequency bands, including those assigned to FM broadcasting, have been discovered by the Federal Communications Commission. A "burst" is defined as a sharp increase in signal strength of momentary duration, seldom covering more time than is necessary to speak a single word or to play a note or two of music. They may occur at the rate of several hundred an hour. The bursts, under normal conditions, are not observed near FM stations. They usually are picked up by receiving sets at a considerable distance from the FM transmitter. Bursts have been observed at distances up to 1,400 miles from certain high-powered FM stations, but are neither so intense nor so numerous as they are at distances of 300 to 700 miles. For several months FCC engineers have been conducting tests to determine the nature and extent of the interference. The FCC is not ready yet to make a statement as to the cause of the bursts, but research is continuing, and a report may be made available soon.

MUCH attention is being attracted by the report of a diet that seems to help patients with high blood pressure and kidney disease. Dr. Walter Kempner, of Duke University, developed the diet and reported it to the Chicago meeting of the American Medical Association. It consists solely of rice, fruit juices, sugar, vitamins and iron. Dr. Kempner's theory is that one of the kidneys' functions, that of deaminating the amino acids of protein, is disturbed by lowered oxygen supply and the result is high blood pressure. The rice diet was developed to reduce the amount of protein the kidneys have to handle and thus lower the amount of harmful, abnormal substances which he believes causes the high blood pressure. Not all patients benefit from the diet, though no ill effects from it have been seen. Blood pressures were reduced in about 60 per cent. of the patients, he said.

A NEW fire-detecting and fire-extinguishing system, that signals the driver the moment a fire breaks out and then extinguishes the flame is being used in U. S. Army tanks, saving many of them from destruction by fire in the tank itself. The system, developed by Walter Kidde and Company, consists of a detector containing two filaments which are destroyed by fire, closing an electric switch which causes a red fire signal to appear on the instrument panel of the tank. The driver pulls a manual control level switch, instantly flooding the engine compartment with a blanket of carbon dioxide gas which smothers the fire. Operation of the new carbon dioxide fire-fighting system is confined to the engine compartment.

IN an effort to get the most out of our dwindling supply of several western pine species, the Office of Price Administration has requested lumber mills to manufacture lath in connection with lumber production. This measure was taken so that fuller use would be made of the logs, and that a minimum of the precious wood would go to waste. Due largely to over-cutting and fires, the supply of western pine is far below normal. Lath made from slabs that would otherwise go to the burner will be used to manufacture boxes and crates needed for the shipment of war material, thus stretching the supply of wood for such purposes.

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SCIENCE NEWS

Science Service, Washington, D. C.

THE ORGANIZATION OF SCIENCE

THE joint science committee of Army, Navy and leading research organizations, the formation of which has been made public, has as its aim the continued utilization of the talents of leading American scientists after the war is over, and they have been demobilized from the present emergency jobs and are back at their regular research tasks.

It is not expected that the Office of Scientific Research and Development, the principal channel for the direction of scientists' efforts toward victory, will be continued after the fighting stops. The thousands of research men and women now engaged in wartime tasks have the "go home" urge no less than the fighters overseas, and their work will be no less needed in building the peace-time America than it is now in helping to win the war.

Maintaining a big, centralized peace-time organization of scientists is not considered advisable by scientific leaders in Washington. Such an organization tends to become stiff and unwieldy—to use a hateful word, bureaucratic.

Two possible procedures are under consideration by the committee. Either can be used separately, or both may be used together. Both have been used successfully in furthering peace-time research programs.

One method is to have a small group of leading scientists who meet frequently, to lay out and supervise research projects. These may be carried out in laboratories under the direct control of the committee, or in government or independent laboratories. The pre-war work of the National Advisory Committee for Aeronautics, which is responsible for a considerable part of America's present leadership in the air, is an excellent example of this procedure.

The second method is to contract directly with universities and institutes of technology for definite research jobs to be done in their laboratories, utilizing their personnel and facilities. This method has been used a great deal, and with much success, by private industries and research foundations sponsored by industrial groups.

The newly organized committee is discussing definite plans embodying either or both of these methods, or possibly others that may be recommended.

ITEMS

THAT material is ejected from a faint double star, known to astronomers as HD 214419, with such force that its composition changes radically in less than twenty-four hours, is reported by Dr. William A. Hiltner of the Yerkes and McDonald Observatories of the Universities of Chicago and Texas in the *Astrophysical Journal*. The star is greenish-white of about the ninth magnitude and therefore invisible without the aid of a telescope. Located near the less-familiar constellation of Lacerta, the Lizard, in the northern hemisphere, the Wolf-Rayet star is very massive and is one of the hottest of heavenly bodies. Little is known about the companion star, but the more familiar component is made up largely of helium and nitrogen. The system varies periodically in brightness, although the Wolf-Rayet component has never been seen to be eclipsed. The variation is slight, however, and can be explained as due to reflection of the light of the other star on the Wolf-Rayet component. It is pointed out that "since the contribution by the companion star to the total light is appreciable, it is remarkable that no spectral features of the companion have been observed."

FLYERS returning from action overseas will have to unlearn much that they have been taught about aerial acrobatics. Acrobatics will not be permitted in this country, where they might endanger lives and property. Combat pilots and air crews will receive a special training course in the principles of flying safety before they are reassigned to active flying duty. The course includes a review of regulations governing the operation of aircraft in the United States and air traffic rules. The course will be given at three Army Air Force redistribution stations, two on the Atlantic coast and one in California. In inaugurating the new policy, General H. H. Arnold, Commanding General, AAF, stated "Flying safety in this country shall have first consideration, and unsafe flying habits acquired in combat must be forgotten. Violations of flying regulations will not be tolerated."

THE Navy's new thin-film rust preventive keeps landing craft ready at all times for the "go ahead" signal. The new preventive protects engines and other vital moving parts against damaging corrosion which might result during construction and long ocean voyages and from local climatic conditions in widely-separated fighting fronts. Thin-film treatments, developed by the Navy Department's Bureau of Ships and the Bureau of Aeronautics, have a remarkable ability to displace water from metal surfaces, and do not have to be removed from the treated surfaces of engines and moving parts before the craft are placed in service. The actual compositions of the new thin-film compounds are not revealed at the present time. Thin-film coatings do away with the old time-consuming process of removing "thick" coatings of ordinary grease before vessels are placed in service.

FOUR steps to avoid dangers resulting from the formation of hot engine sludge in motor vehicles were recommended by H. C. Mougey, of the research laboratories of the General Motors Corporation, at the national transportation and maintenance division of the Chicago meeting of the Society of Automotive Engineers. The four steps include the application of oil filters to remove the sludge as it forms; adequate temperature control to prevent excessive heat which causes oil oxidation and sludge formation, without permitting engine temperatures to get so low as to form low-heat sludge; frequent crankcase draining to prevent sludge accumulations from becoming too large; and the use of high quality, heavy-duty oils that have good resistance to oxidation. When these oils are drained, they carry away much of the sludge and leave a comparatively clean engine.

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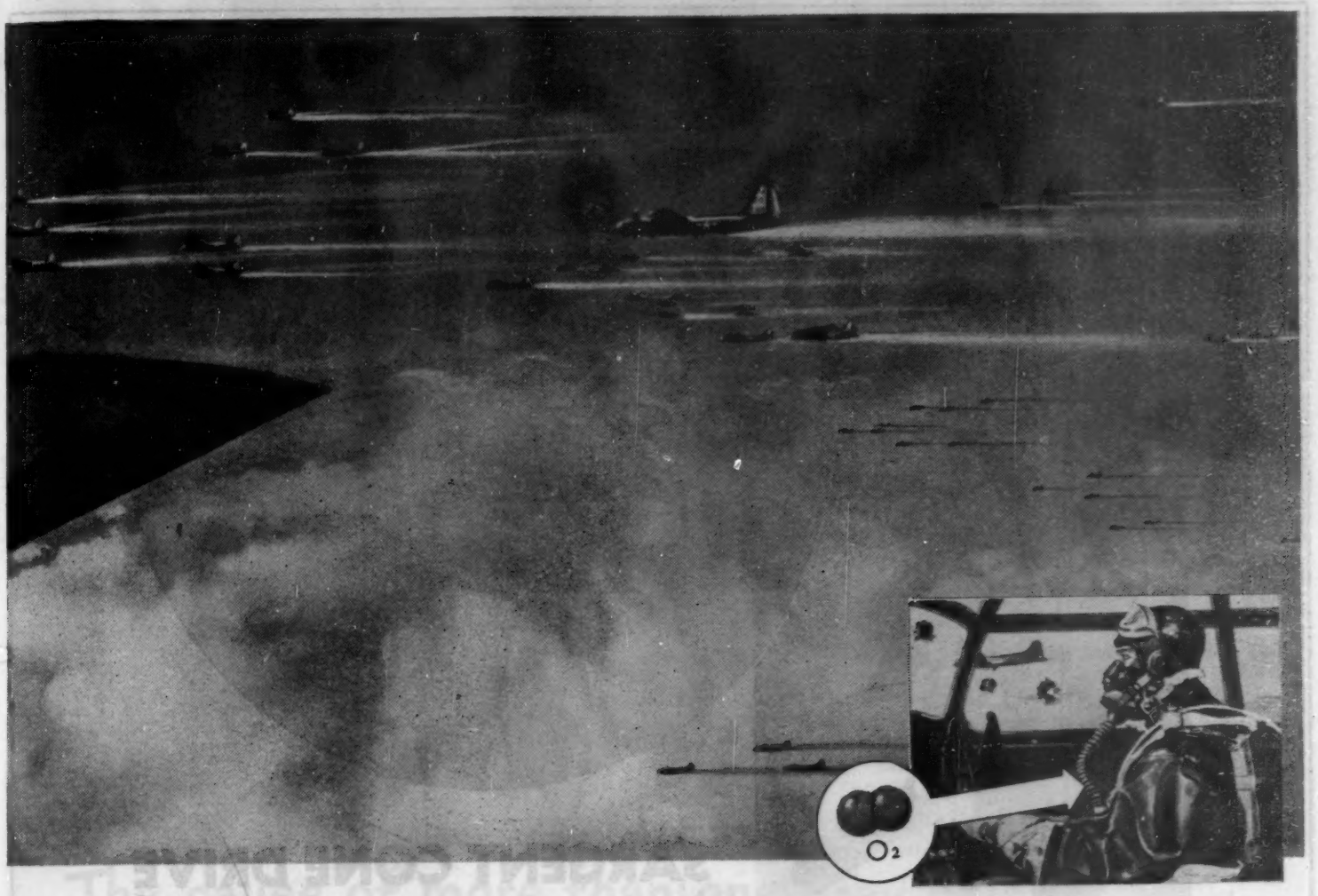

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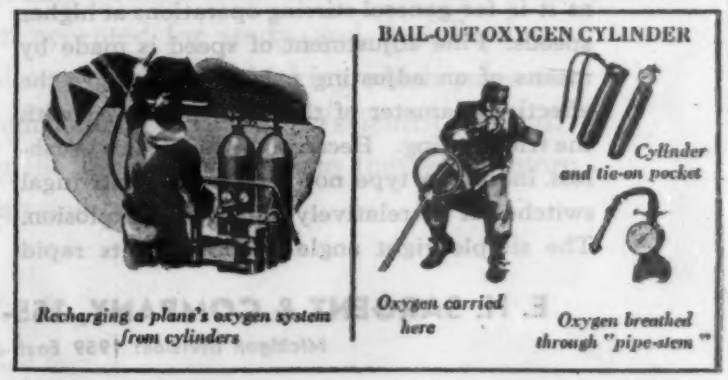
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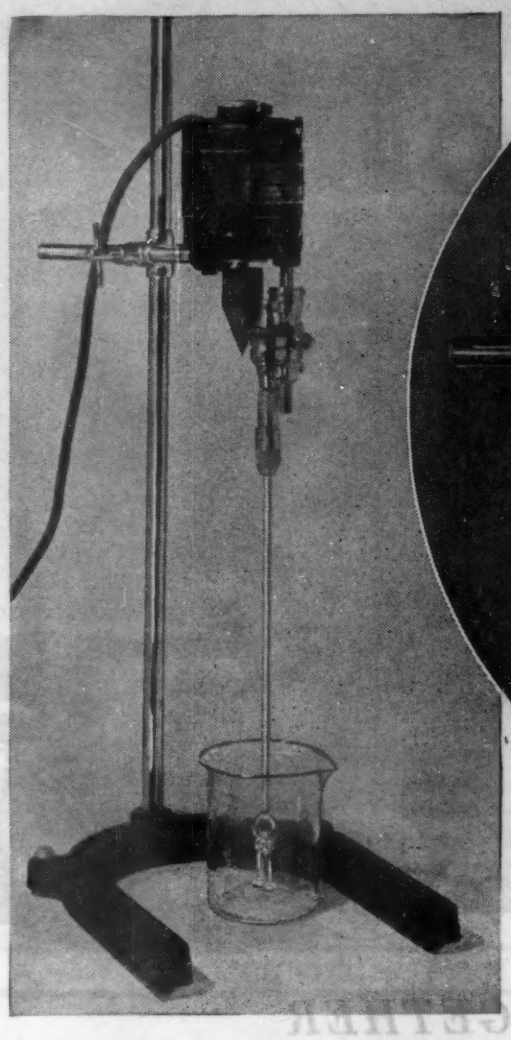

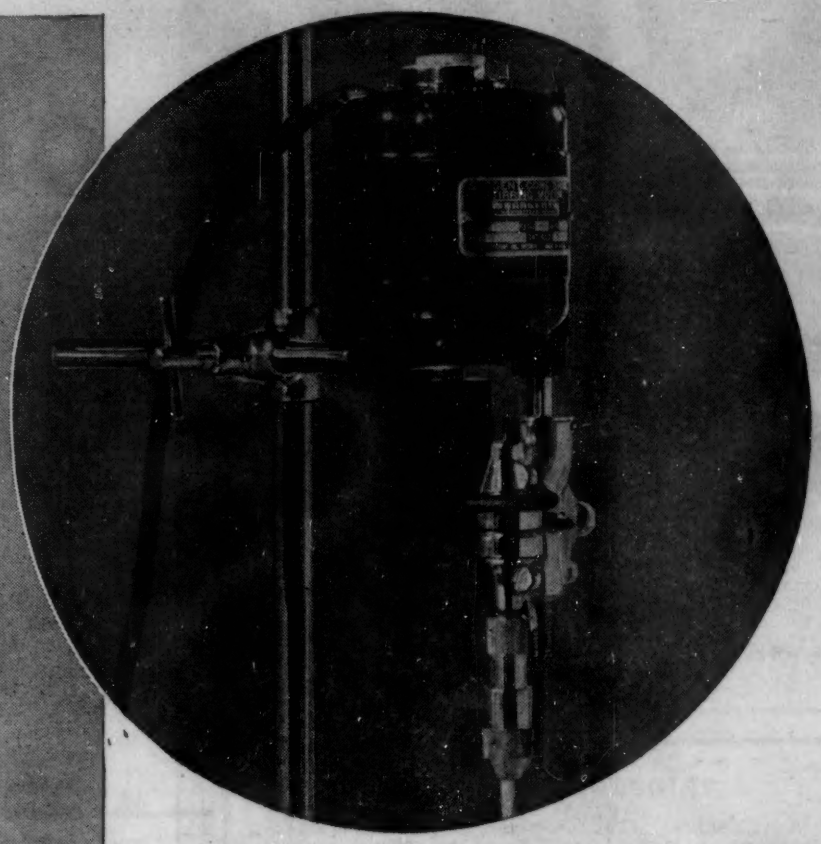

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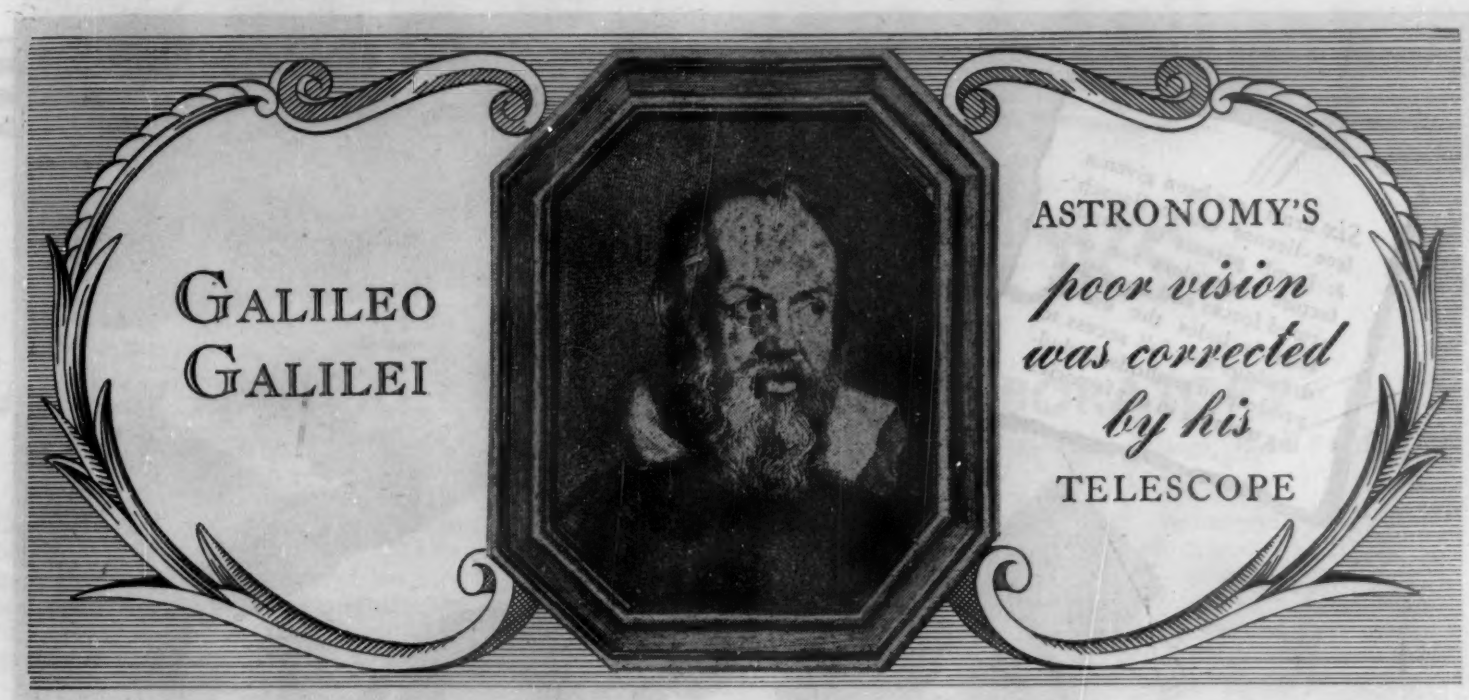

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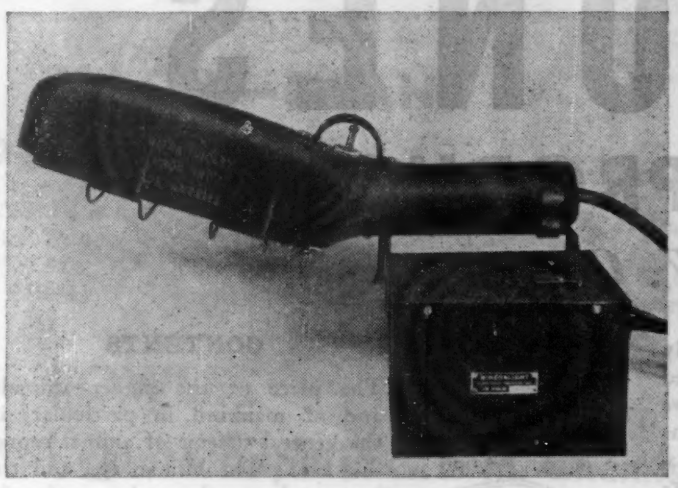

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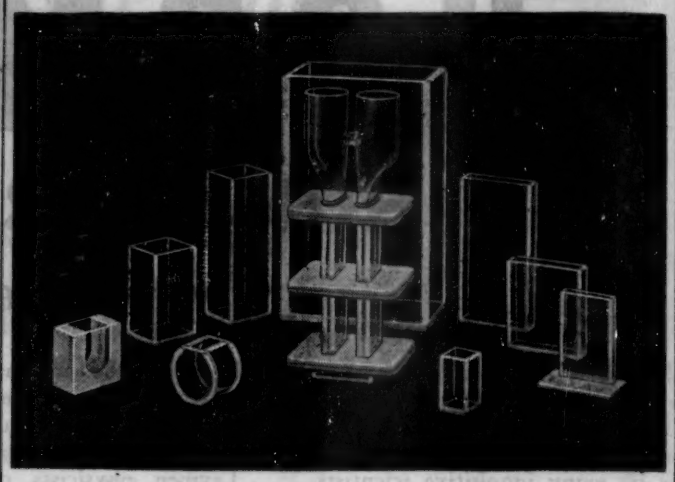

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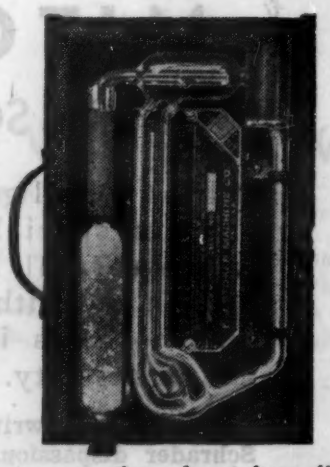

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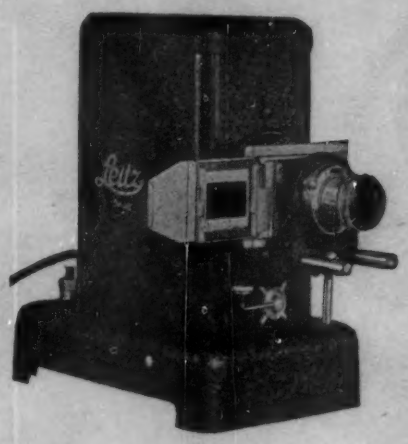

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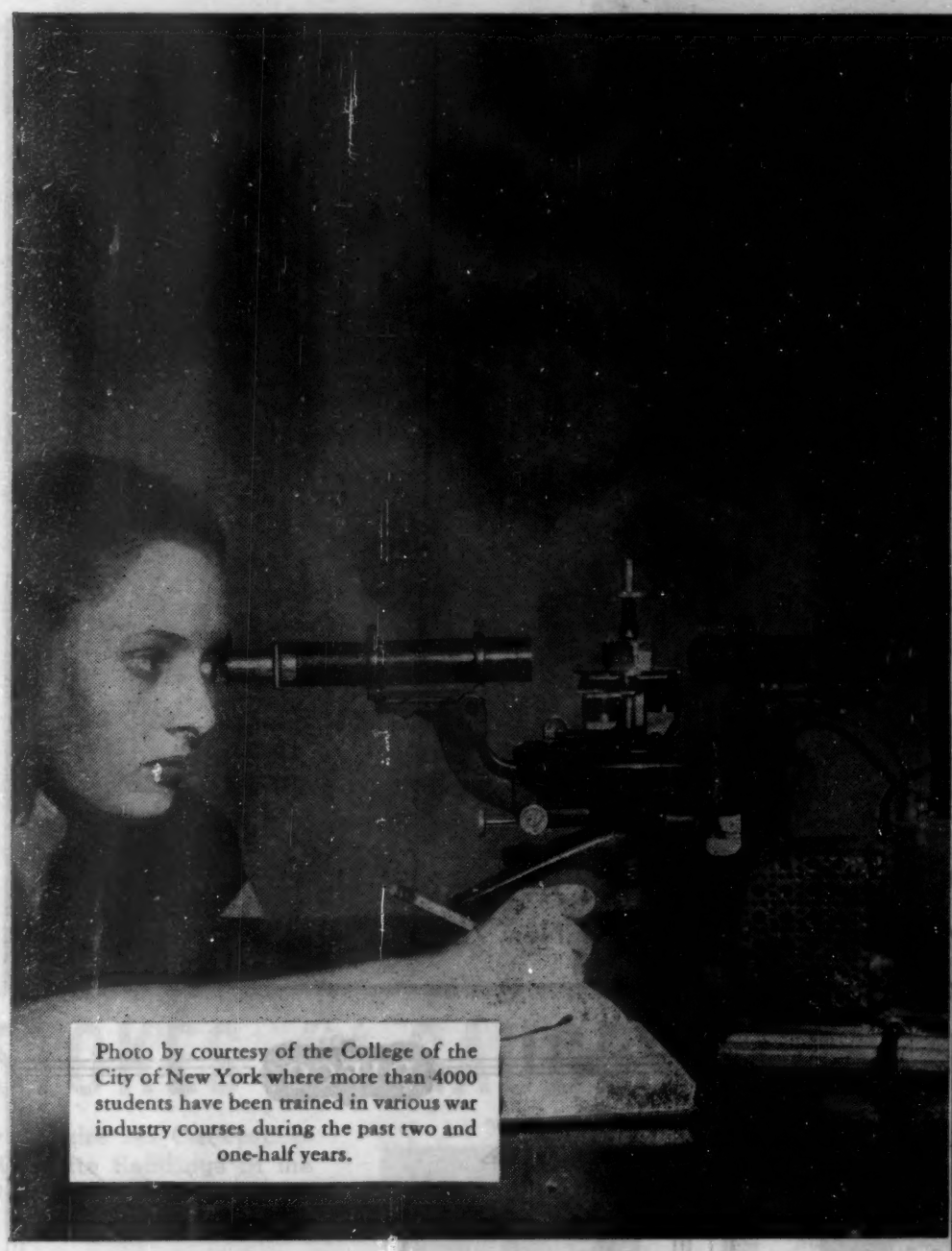

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